

## PATENT ABSTRACTS OF JAPAN

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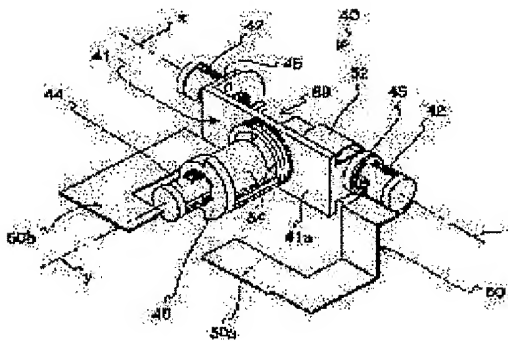
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(54) BIAXIAL HINGE DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a biaxial hinge device capable of preventing damage or the like on a flexible board of an electronic apparatus using a biaxial hinge, to assure electrical connection.

SOLUTION: A biaxial hinge device 40 used for an electronic apparatus is provided with a first case 24 and a second case 22. Here, the first case 24 is rotatable, relative to the second case 22, around an axial line x of a first shaft 42, while the first case 24 is rotatable, relative to the second case 22, around an axial line y of a second shaft 44 extending orthogonal to the axial direction x of the first shaft 42. A flexible



board 50 is provided to electrically connect the first case 24 to the second case 22. Related to the flexible board 50, a first winding part 52 is wound around the axial line x of the first shaft 42, and a second winding part 54 is wound around the axial line y of the second shaft 44.

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## CLAIMS

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[Claim(s)]

[Claim 1] So that it may have the 1st case and 2nd case and said 1st case may become rotatable focusing on an axis of the 1st rotating shaft to said 2nd case, And in a biaxial hinge device used for electronic equipment formed so that the 1st case might become rotatable focusing on an axis of the 2nd rotating shaft prolonged in the direction which intersects perpendicularly with an axial direction of said 1st rotating shaft to the 2nd case, Provide a flexible substrate arranged that between said 1st case and said 2nd case should electrically be connected, and to this flexible substrate. A biaxial hinge device, wherein the 1st winding part wound on an axis of said 1st rotating shaft and the 2nd winding part wound on an axis of said 2nd rotating shaft are formed.

[Claim 2] In a position corresponding to each center of said 1st winding part and said 2nd winding part. The 1st flat part and the 2nd flat part which are prolonged in an axial direction of a rotating shaft corresponding to each winding part are provided, The piece of the 1st winding and the piece of the 2nd winding which were formed in the direction which intersects perpendicularly by bending from an extending direction of said 1st flat part and said 2nd flat part are provided, The biaxial hinge device according to claim 1 when this piece of the 1st winding and the piece of the 2nd winding wind the circumference of said 1st flat part and the 2nd flat part, wherein said 1st winding part and the 2nd winding part are formed.

[Claim 3] The biaxial hinge device according to claim 2, wherein the back up plate reinforced so that bending of a flexible substrate may be prevented is attached to said 1st flat part and/or the 2nd flat part along an axial direction of an axis currently wound around a circumferencial direction.

[Claim 4] The biaxial hinge device according to claim 3, wherein said back up plate is formed in the shape of an L character so that it may be attached over said 1st flat part and the 2nd flat part.

[Claim 5] The biaxial hinge device according to claim 1, 2, 3, or 4, wherein while is connected to the 1st case and 2nd case of said flexible substrate and a connector is provided in an end and an end of another side.

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## DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the biaxial hinge device with which two or more cases are used in the electronic equipment formed rotatable especially a foldaway cellular phone, the video camera which can develop monitor display, etc. with two axes.

[0002]

[Description of the Prior Art] In recent years, in electronic equipment, such as a video camera, the thing of structure which monitor display etc. develop from a main part and in which this monitor display carries out rear surface inversion is developed. In such electronic equipment, the biaxial hinge device which has two rotating shafts is used for the 2-way which intersects perpendicularly mutually, and the flexible substrate for wiring monitor display and a main part is provided in this biaxial hinge device.

[0003]

[Problem(s) to be Solved by the Invention] However, if it is when a biaxial hinge which has been mentioned above is used in electronic equipment, By rotating each case of electronic equipment repeatedly, the flexible substrate which electrically connects was bent repeatedly and the technical problem that there was a possibility that intensity may deteriorate and a flexible substrate may be damaged occurred.

[0004] In recent years, the fold-up formula cellular phone which made the screen portion and the ten key portion foldable is increasing rapidly by using as a different body the body part which has a screen portion and a ten key portion. what is established [ the screen portion of this fold-up formula cellular phone ] for a biaxial hinge -- a rear surface -- the model provided pivotable has also been considered. In such a cellular phone, the wiring which connects a screen portion and the body part which has a ten key portion turns into more [ far ] wiring than the case where the monitor display and the main part in a video camera are connected. When a biaxial hinge device is used for such a cellular phone, it is necessary for it to use a broad flexible substrate with many wiring numbers. Rather than the time of adopting a biaxial hinge as a video camera, in this case, the handling of a flexible substrate is still more difficult, and not to mention the breakage prevention of a flexible substrate, The technical problem that it was necessary to store with sufficient space efficiency in a biaxial hinge so that it may not become the obstacle of rotation of a screen portion occurred.

[0005] Then, there is a place which this invention is made that an aforementioned problem should be solved and is made into the purpose in providing the biaxial hinge

device which prevents breakage etc. of the flexible substrate of the electronic equipment which uses a biaxial hinge, and makes an electrical link a positive thing.

[0006]

[Means for Solving the Problem]Namely, so that according to the biaxial hinge device concerning this invention it may have the 1st case and 2nd case and said 1st case may become rotatable focusing on an axis of the 1st rotating shaft to said 2nd case, And in a biaxial hinge device used for electronic equipment formed so that the 1st case might become rotatable focusing on an axis of the 2nd rotating shaft prolonged in the direction which intersects perpendicularly with an axial direction of said 1st rotating shaft to the 2nd case, Provide a flexible substrate arranged that between said 1st case and said 2nd case should electrically be connected, and to this flexible substrate. It is characterized by forming the 1st winding part wound on an axis of said 1st rotating shaft, and the 2nd winding part wound on an axis of said 2nd rotating shaft. Even if it is a case where the 1st case of electronic equipment rotates to the 2nd case by adopting this composition focusing on an axis of the 1st rotating shaft, and an axis of the 2nd rotating shaft, Since the 1st winding part and the 2nd winding part only operate in the direction to which a direction or a path to which a path of each winding part is reduced is expanded, load by bending is not applied to a flexible substrate, but breakage of a flexible substrate, etc. can be prevented.

[0007]In a position corresponding to each center of said 1st winding part and said 2nd winding part. The 1st flat part and the 2nd flat part which are prolonged in an axial direction of a rotating shaft corresponding to each winding part are provided, The piece of the 1st winding and the piece of the 2nd winding which are bent in the direction which intersects perpendicularly from an extending direction of said 1st flat part and said 2nd flat part are provided, When this piece of the 1st winding and the piece of the 2nd winding wind the circumference of said 1st flat part and the 2nd flat part, said 1st winding part and the 2nd winding part are formed. According to this composition, it becomes possible to arrange a flexible substrate to a part which is not a shaft part of the 1st rotating shaft and the 2nd rotating shaft, i.e., arrange a winding part of a flexible substrate to a part formed in midair on an axis of each rotating shaft. And space efficiency is improved by arrangement of a flexible substrate, preventing breakage etc. without applying load to a flexible substrate.

[0008]The back up plate reinforced so that bending of a flexible substrate may be prevented is attached to said 1st flat part and/or the 2nd flat part along an axial direction of an axis currently wound around a circumferencial direction. According to this composition, when forming the 1st winding part and/or the 2nd winding part, it can

wind easily, and intensity maintenance can also be aimed at so that a winding part may not change after winding each winding part.

[0009] Since said back up plate is characterized by being formed in the shape of an L character so that it may be attached over said 1st flat part and the 2nd flat part, Since intensity maintenance of each winding part can be aimed at by a single member, it can contribute to reduction of part mark, and intensity maintenance of both winding parts can be further made into a still more positive thing. While is connected to the 1st case and 2nd case of said flexible substrate, and a connector may be made to be provided in an end and an end of another side.

[0010]

[Embodiment of the Invention] Hereafter, the suitable embodiment of this invention is described in detail based on an accompanying drawing. First, based on drawing 1 - drawing 3, an example of the electronic equipment using a biaxial hinge device is shown. An example of the electronic equipment explained here is a cellular phone. That is, this cellular phone 20 comprises the main part 22 in which the ten key portion was provided, and the indicator 24 in which the liquid crystal display was provided. The main part 22 and the indicator 24 are the 1st case or 2nd case said to a claim. The biaxial hinge device 30 is formed in the part which connects the main part 22 and the indicator 24.

[0011] Drawing 1 shows the place whose cellular phone 20 is a waiting state. As for the cellular phone 20, in the waiting state, the main part 22 and the indicator 24 are folded up so that the field 22a established for the ten key and the field 24a in which the liquid crystal display is provided may face mutually. When performing a telephone call etc., as shown in drawing 2, it talks over the telephone by opening the indicator 24 to the main part 22. Deployment of the indicator 24 is performed by rotating the indicator 24 focusing on the axis x of the 1st rotating shaft 32 of the biaxial hinge device 30.

[0012] This cellular phone 20 is formed rotatable focusing on the axis y of the rotating shaft (not shown) which has an axis in the direction which intersects the indicator 24 perpendicularly with the 1st rotating shaft 32 of the biaxial hinge device 30 as shown in drawing 3. In other words, the indicator 24 can carry out rear surface inversion of the field 24a in which it is rotatable as a center and the liquid crystal display is provided in the axis y parallel to the longitudinal direction of the cellular phone 20 to the main part 22.

[0013] Thus, when rear surface inversion of the indicator 24 can be carried out, it can be used now and a CCD camera etc. are attached to the indicator 24, for example by adopting the biaxial hinge device 30 as the folding mechanism of the foldaway cellular

phone 20, even if it is, it comes to be able to make photography easy to carry out.

[0014]Based on (a 1st embodiment) next drawing 4 – drawing 8, a 1st embodiment of the biaxial hinge device used for the cellular phone as an example of electronic equipment which was mentioned above is described. Drawing 4 shows the perspective view of a biaxial hinge device, and the side view in which the assembly exploded view of a biaxial hinge device and drawing 6 saw the partial sectional view of the hinge, drawing 7 saw the development view of the flexible substrate, and, as for drawing 8, drawing 5 saw the winding part of the flexible substrate from the side. The biaxial hinge device 40 of a 1st embodiment is provided with the following.

Body part 41.

The two hinges 42 rotated focusing on the axis x to this body part 41.

The hinge 44 which has the axis y in the direction which intersects perpendicularly with the axis x direction of the hinge 42, and is rotated focusing on the axis y.

The flexible substrate 50 is arranged through the axis x direction and the axis y direction in this body part 41. One end 50a of the flexible substrate 50 is connected to one case of electronic equipment. And the end 50b of another side is rotatable so that it folds up to one case of electronic equipment (or deployment), and it may be possible and rear surface inversion may be carried out, and also it is connected to the case of a way.

[0015]The fitting part 45 for the body part 41 to attach the hinge 42 is formed in two places along the axis x. The fitting part 46 which can attach the hinge 44 is formed in the base 41a of the body part 41 which has connected two fitting part 45 comrades of the body part 41 along the axis y. The body part 41 is equipped with the covering 37. The fitting part 46 carries out prescribed distance projection to the axis y direction which intersects perpendicularly with an axis x direction from the base 41a, and it is formed so that the hinge 44 may be attached in the direction which intersects perpendicularly on the flat surface of the base 41a. Between the fitting part 46 and the base 41a, the attachment arm part 82 of the shape which cut cylindrical [ a part of ], and lacked and formed it is formed. The winding part 54 of the flexible substrate 50 mentioned later is stored by the attachment arm part 82.

[0016]In this embodiment, the hinge 42 and the hinge 44 have adopted the thing of the same structure. The 1st member 43 and the 2nd member 39 are arranged along the respectively same axial direction, it is attached and the hinges 42 and 44 are constituted so that rotation may become free focusing on an axis mutually. When it explains still in detail, the 2nd member 39 of the hinges 42 and 44, The body 71 by which the inside was formed in the centrum 73 as shown in drawing 6, and the shaft 70

by which the end has been arranged rotatable to the body 71 in the centrum 73 of the body 71, Leave the crevice h to the body 71 and it is arranged at the 1st member 43 side, and the movable cam plate 74 and \*\* are provided in the axial direction of the shaft 70 so that it may not rotate to the body 71.

[0017]The 1st member 43 is provided with the following.

The cam 76 which the other end of the shaft 70 is being fixed and has a click function held by a halt condition to the cam plate 74 in a prescribed position.

The fit part 78 attached to the fitting part 45 of the body part 41.

It applies to the 2nd member 39 from the 1st member 43, and the compression spring 80 is formed in the circumference of the shaft 70. It is compressed and equipped with the compression spring 80 between the cam plate 74 and the upper bed part of the body 71, and he is trying to always push the cam plate 74 against the cam 76. Two or more projections (not shown) which project towards cam 76 direction are provided in the cam plate 74, and two or more crevices (not shown) arranged in the projection of the cam plate 74 at the position which can be stored, respectively are established in the cam 76.

[0018]Operation in case the 2nd member 39 rotates to the part I material 43 is explained. If the 2nd member 39 rotates to the 1st member 43, the cam plate 74 pressed by the compression spring 80 contacting the cam 76, predetermined torque will arise with the cam plate 74 pressed by the compression spring 80 at the time of rotation. moreover — a projection gets into a crevice between the cam plate 74 and the cam 76 — being crowded (stored) — if the thrust of the compression spring 80 is resisted and the cam plate 74 is not moved in the move direction of the compression spring 80, the shaft 70 stops rotating For this reason, rotation of the shaft 70 is maintained by the stop state in this position. Thus, the click action which rotational operation suspends in the position which the projection of the cam plate 74 gets into the crevice of the cam 76, and is crowded is realizable.

[0019]The 1st member 43 of such hinges 42 and 44 is attached to the fitting part 45 or 46 of the body part 41. The fit part 78 is inserted as a slip off stop into the attaching hole 81 of each fitting parts 45 and 46, and the engaging projection 47 formed in the fitting parts 45 and 46 can be inserted in to the slot 49 formed in the 1st member 43, and the attachment to the fitting parts 45 and 46 of the part I material 43 is fixed. Therefore, if each hinges 42 and 44 are attached to the body part 41, the body part 41 will become rotatable as a center about each axes x and y to the 2nd member 39.

[0020]Next, a flexible substrate is explained. The two winding parts 52 and 54 which

the flexible substrate 50 rolled self and were formed are formed. The winding part 52 is formed so that it may wind around the hoop direction of the circle centering on the axis x on the axis x, and it forms one winding part 54 so that it may wind around the hoop direction of the circle centering on the axis y on the axis y. In other words, the winding parts 52 and 54 draw a round shape on each circumference of the axes x and y mostly focusing on each hinge 42 and the axes x and y of rotation of 44, round off the flexible substrate 50, and are formed. This winding part 52 is arranged among both the fitting parts 45 and 45 of the body part 41, and corresponds to rotation centering on the axis x of the hinge 42. And one winding part 54 is arranged between the base part 41a and the fitting part 46, and corresponds to rotation centering on the axis y of the hinge 44.

[0021]The structure of the flexible substrate 50 is explained based on drawing 7 which is the top view which developed and extended both the winding parts 52 and 54 of the flexible substrate 50. The point which the flexible substrate 50 can form copper foil in thin films, such as polyimide, can use it as a wiring board, and can be bent freely is the feature. The flexible substrate 50 adopted as this embodiment is provided with the following.

The flat part 55 arranged along the axis x of the rotating shaft of the hinge 42 of the biaxial hinge device 40.

The flat part 57 arranged along the axis y of the rotating shaft of the hinge 44.

Since they aim to intersect perpendicularly mutually, the axes x and y are formed so that the flat part 55 and the flat part 57 may also intersect perpendicularly mutually, double the flat part 55 and the flat part 57, and are formed as the plane view L character-like angle part 59.

[0022]The L in all character-like back up plate 60 is stuck on the surface by adhesives etc. in the shape of the angle part 59 at the angle part 59 which doubled the flat part 55 and the flat part 57. The back up plate 60 specifically comprises glass epoxy etc. The back up plate 60 is fixed to plate-like so that the flat part 55 and the flat part 57 which were attached may not be bent or it may not be twisted.

[0023]From the end of the flat part's 57 connection side of the flat part 55, and an opposite hand, the piece 62 of winding prolonged towards the direction which intersects perpendicularly with the axis x is formed. (Referring to the arrow A of drawing 7) and the winding part 52 are formed by rolling it focusing on the flat part 55, as this piece 62 of winding twists. On the other hand, from the end of the connection side with the flat part 55 of the flat part 57, and an opposite hand, the piece 64 of winding prolonged towards the direction which intersects perpendicularly with the axis



y is formed. (Referring to the arrow B of drawing 7) and the winding part 54 are formed by rolling it focusing on the flat part 57, as this piece 64 of winding twists.

[0024]As shown in drawing 7, by forming, as the winding parts 52 and 54 were mentioned above, it extends in an axis x direction, and the flat part 55 arranged so that it may become parallel to this x-y flat surface on an axis x-y flat surface is located at the center of the winding part 52 by it. Similarly, it extends in an axis y direction and the flat part 57 arranged so that it may become parallel to this x-y flat surface on an axis x-y flat surface is located at the center of the winding part 54.

[0025]Next, arrangement within the biaxial hinge of both winding parts is explained. The winding part 52 is located in the space part 89 formed between the two hinges 42 and 42 with which the center of winding forms the axis x. The space part 89 is a portion of the hollow formed between the two fitting parts 45 in the body part 41. Thus, the winding part 52 is arranged on the axis x at a position in the air. Since the flat part 55 to which the back up plate 60 was attached consists in the center of the winding part 52 at this time, even if arranged in the space part 89, what the winding part 52 shifted from on the axis x, or the volume of the piece 62 of winding loosens and carries out it, and said it relaxedly can be prevented.

[0026]On the other hand, the winding part 54 is laid on the attachment arm part 82 formed between the base 41a and the fitting part 46 so that the center of winding may become the axis y top of the hinge 44. However, since this attachment arm part 82 is what is formed in order to attach the fitting part 46 to the base 41a, this attachment arm part 82 does not need to exist for the winding part 54. Since the flat part 57 to which the back up plate 60 was attached consists in the center of the winding part 54 at this time, even if only laid on the attachment arm part 82, what the winding part 54 shifted from on the axis y, or the volume of the piece 64 of winding loosens and carries out it, and said it relaxedly can be prevented.

[0027]The place which equipped the cellular phone 20 shown in drawing 1 – drawing 3 with the biaxial hinge device of a 1st embodiment mentioned above is shown in drawing 9 and drawing 10. At drawing 9, the place which attached the hinge 44 to the indicator 24 of the cellular phone 20 is shown, and drawing 10 shows the place which equipped the hinge applied part 84 of the main part 22 of the cellular phone 20 with the hinge 42. Here, the both ends 50a and 50b of the flexible substrate 50 are equipped with the connectors 126a and 126b for connecting with both the cases 22 and 24 of the cellular phone 20, respectively. Within the indicator 24, the hinge 44 is fixed in the indicator 24 and the body part 41 of the biaxial hinge device 40 is held rotatable focusing on the axis y to the indicator 24. The hinge 42 is fixed to the hinge

applied part 84 of the main part 22. For this reason, the body part 41 of the biaxial hinge device 40 is held rotatable focusing on the axis x to the main part 22 of a cellular phone.

[0028]In (a 2nd embodiment), next the biaxial hinge device of this invention, a 2nd embodiment that has a different gestalt from a 1st embodiment mentioned above is described based on drawing 11 – drawing 13. The numerals same about the same component as a 1st embodiment mentioned above may be attached, and explanation may be omitted.

[0029]Drawing 11 shows the perspective view of a biaxial hinge device, drawing 12 shows the assembly exploded view of a biaxial hinge device, and Drawing 147 shows the development view of the flexible substrate. The hinge 42 as the embodiment which mentioned the 1st rotating shaft above unlike a 1st embodiment with same point of having provided the shaft which the biaxial hinge device 90 of a 2nd embodiment is open for free passage to the case and biaxial hinge device of electronic equipment, and is arranged in the 2nd rotating shaft is adopted. Here, the both ends 100a and 100b of the flexible substrate 100 are equipped with the connectors 126a and 126b, respectively.

[0030]This biaxial hinge device 90 is provided with the following.

Body part 91.

The two hinges 42 rotated focusing on the axis x to this body part 91.

The hinge unit 94 which has the axis y in the direction which intersects perpendicularly with the axis x direction of the hinge 42, and rotates focusing on the axis y.

The flexible substrate 100 is arranged through the axis x direction and the axis y direction in this body part 91. One end 100a of the flexible substrate 100 is connected to one case of electronic equipment. And the end 100b of another side is folded up to one case of electronic equipment (or deployment), it is possible, and is rotatable to rear surface reverse, and also it is connected to the case of a way.

[0031]The fitting part 95 for attaching the hinge 42 to the body part 91 is formed in two places along the axis x. The fitting part 96 to which the screw stop of the hinge unit 94 is carried out is formed in the body part 91. Specifically, the fitting part 96 comprises the attaching part 110 of the screw hole 99 which carries out the screw stop of the hinge unit 94, and the shape of half-segmented [ which hold the hinge unit 94 together with the covering 97 of the body part 91 ].

[0032]The hinge unit 94 is explained. In between the bracket 111 with which the hinge unit 94 is fixed to the body part 91, the bracket 112 fixed to the 2nd case of electronic

equipment, and the brackets 111 and the brackets 112, One end is fixed to the bracket 111 and the other end is \*\* constituted with the shaft 115 attached to the bracket 112 rotatable via the click board 114.

[0033]If rotation of the shaft 115 becomes a predetermined angle, the click board 114 is formed so that rotation may stop with this predetermined angle. The energization board 116 which has the projection 117 which projects towards the side in which the click board 114 is located is formed in the bracket 112. The energization board 116 is energized so that it may always project in the click board 114 direction, and it is formed as the projection 117 always touches the click board 114. On the other hand, the notch 118 which can store the height 117 is formed in the click board 114.

[0034]The click function of the hinge unit 94 is explained. If the shaft 115 is rotated, in the projection 117, in slide contact with the click board 114, predetermined torque will occur in rotation of the shaft 115. furthermore -- the projection 117 fits into the notch 118 of the click board 114 -- being crowded (stored) -- since the shaft 115 stops rotating if the energizing force of the energization board 116 is resisted and the projection 117 is not depressed, rotation of a shaft is maintained by the stop state in this position.

[0035]Next, the flexible substrate of a 2nd embodiment is explained. The winding part 102 which the flexible substrate 100 rolled self and formed it, and the winding part 104 which twisted around the circumference of the shaft 115 and was formed are formed. That is, the winding part 102 is formed so that it may wind around the hoop direction of the circle centering on the axis x on the axis x, and it forms one winding part 104 so that it may wind around the hoop direction of the circle centering on the axis y on the axis y. In other words, focusing on the axes x and y of rotation of the flexible substrate 100 of the hinge 42 and the hinge unit 94, the winding part 102,104 draws a round shape on each circumference of the axes x and y mostly, rounds off to it, and is formed in it. This winding part 102 is arranged among both the fitting parts 45 and 45 of the body part 91, and corresponds to rotation centering on the axis x of the hinge 42. And one winding part 104 corresponds to rotation centering on the axis y of the shaft 115 of the hinge unit 94.

[0036]The structure of the flexible substrate 100 is explained based on drawing 13 which is the top view which developed and extended both the winding parts 102,104 of the flexible substrate 100. The flexible substrate 100 adopted as this embodiment is provided with the following.

The flat part 105 arranged along the axis x of the rotating shaft of the hinge 42 of the biaxial hinge device 90.

The flat part 107 arranged along the axis y of the rotating shaft of the hinge unit 94. Since the axes x and y aim to intersect perpendicularly mutually, it is formed so that the flat part 105 and the flat part 107 may also intersect perpendicularly mutually.

[0037]The back up plate 120 is stuck on the surface by adhesives etc. at the flat part 105. The back up plate 120 comprises glass epoxy etc., as mentioned above. The back up plate 120 is fixed to plate-like so that the attached flat part 105 may not be bent or it may not be twisted.

[0038]From the end of the flat part's 107 connection side of the flat part 105, and an opposite hand, the piece 122 of winding prolonged towards the direction which intersects perpendicularly with the axis x is formed. (Referring to the arrow A of drawing 13) and the winding part 102 are formed by rolling it focusing on the flat part 105, as this piece 122 of winding twists. On the other hand, from the end of the connection side with the flat part 105 of the flat part 107, and an opposite hand, the piece 124 of winding prolonged towards the direction which intersects perpendicularly with the axis y is formed. (Referring to the arrow B of drawing 13) and the winding part 104 are formed by this piece 124 of winding being wound around the circumference of the shaft 115 of the hinge unit 94.

[0039]By forming, as the winding part 102 was mentioned above, it extends in an axis x direction, and the flat part 105 arranged so that it may become parallel to this x-y flat surface on an axis x-y flat surface is located at the center of the winding part 102 by it (refer to drawing 13).

[0040]Next, arrangement within the biaxial hinge of both winding parts is explained. The winding part 102 is located in the space part 89 formed between the two hinges 42 and 42 with which the center of winding forms the axis x. The space part 89 is a portion of the hollow formed between the two fitting parts 45 in the body part 91. Thus, the winding part 102 is arranged on the axis x at a position in the air. Since the flat part 105 to which the back up plate 120 was attached consists in the center of the winding part 102 at this time, even if arranged in the space part 89, what the winding part 102 shifted from on the axis x, or the volume of the piece 122 of winding loosens and carries out it, and said it relaxedly can be prevented.

[0041]On the other hand, since the piece 124 of winding is wound around the circumference of the shaft 115 which is the axis y of the rotating shaft of the hinge unit 94, the winding part 104 can prevent what the winding part 104 shifted from on the axis y, or the volume of the piece 124 of winding loosens and carries out it, and said it relaxedly.

[0042]The place which equipped the cellular phone 20 shown in drawing 1 - drawing 3

with the biaxial hinge device of a 1st embodiment mentioned above is shown in drawing 14 and drawing 15. At drawing 14, the place which attached the hinge unit 94 to the indicator 24 of the cellular phone 20 is shown, and drawing 15 shows the place which equipped the hinge applied part 84 of the main part 22 of the cellular phone 20 with the hinge 42. Within the indicator 22, the hinge unit 94 is fixed in the indicator 24, and the body part 91 of the biaxial hinge device 90 is held rotatable focusing on the axis y to the indicator 24. The hinge 42 is fixed to the hinge applied part 84 of the main part 22. For this reason, the body part 91 of the biaxial hinge device 90 is held rotatable focusing on the axis x to the main part 22.

[0043]Two embodiments mentioned above have explained the example about the biaxial hinge device mainly used for a cellular phone. However, the biaxial hinge device of this invention is not limited to what is used for a cellular phone, and may be used for other electronic equipment.

[0044]It is suitable, even if it is not limited to what the gestalt of a hinge has mentioned above as composition of a biaxial hinge device and adopts other hinges or hinge units of a gestalt. Even if it is a case where the hinge 42 mentioned above is adopted, it is good also as composition which forms only the one hinge 42 along an axis x direction.

[0045]As for this invention, although the suitable example was given per this invention above and many things were explained, it is needless to say that many can be changed within limits which are not limited to this example and do not deviate from the pneuma of an invention.

[0046]

[Effect of the Invention]According to the biaxial hinge device concerning this invention, provide the flexible substrate arranged that between the 1st case and the 2nd case should electrically be connected, and to a flexible substrate. By forming the 1st winding part wound on the axis of the 1st rotating shaft, and the 2nd winding part wound on the axis of the 2nd rotating shaft, Since the 1st winding part and the 2nd winding part of a flexible substrate only operate in the direction to which the direction or path to which the path of each winding part is reduced is expanded even if it is a case where the 1st case of electronic equipment rotates to the 2nd case, The load by bending is not applied to a flexible substrate, but breakage of a flexible substrate, etc. can be prevented.

[0047]According to the biaxial hinge device concerning claim 2, in the position corresponding to each center of the 1st winding part and the 2nd winding part. The 1st flat part and the 2nd flat part are provided, and the piece of the 1st winding and the

piece of the 2nd winding which are bent in the direction which intersects perpendicularly from the extending direction of the 1st flat part and the 2nd flat part are provided, Since the 1st winding part and the 2nd winding part are formed when the piece of the 1st winding and the piece of the 2nd winding wind the circumference of the 1st flat part and the 2nd flat part, as [ arrange / to the part formed in midair on arranging a flexible substrate to the part which is not a shaft part of the 1st rotating shaft and the 2nd rotating shaft, i.e., the axis of each rotating shaft, / the winding part of a flexible substrate ] -- it becomes. For this reason, space efficiency is improved by arrangement of a flexible substrate, not applying load by bending to a flexible substrate, but preventing breakage etc.

[0048]According to the biaxial hinge device concerning claim 3, to the 1st flat part and/or the 2nd flat part. Since the back up plate reinforced so that bending of a flexible substrate may be prevented is attached along the axial direction of the axis currently wound around the circumferential direction, when forming the 1st winding part and/or the 2nd winding part, the piece of the 1st winding and the piece of the 2nd winding can be easily twisted around the circumference of a top view. Intensity maintenance can also be aimed at so that a winding part may not change after winding each winding part.

[0049]According to the biaxial hinge device according to claim 4, the back up plate, Since it is characterized by being formed in the shape of an L character so that it may be attached over the 1st flat part and the 2nd flat part, since intensity maintenance of each winding part can be aimed at by a single member, it can contribute to reduction of part mark, and intensity maintenance of both winding parts can be further made into a still more positive thing. Since according to the biaxial hinge device according to claim 5 while is connected to the 1st case and 2nd case of a flexible substrate and the connector is provided in the end and the end of another side, shortening of assembly time can be aimed at in an assembly of the electronic equipment using the biaxial hinge concerned.

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## TECHNICAL FIELD

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[Field of the Invention]This invention relates to the biaxial hinge device with which two or more cases are used in the electronic equipment formed rotatable especially a foldaway cellular phone, the video camera which can develop monitor display, etc. with two axes.

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## PRIOR ART

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[Description of the Prior Art]In recent years, in electronic equipment, such as a video camera, the thing of structure which monitor display etc. develop from a main part and in which this monitor display carries out rear surface inversion is developed. In such electronic equipment, the biaxial hinge device which has two rotating shafts is used for the 2-way which intersects perpendicularly mutually, and the flexible substrate for wiring monitor display and a main part is provided in this biaxial hinge device.

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## EFFECT OF THE INVENTION

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[Effect of the Invention]According to the biaxial hinge device concerning this invention, provide the flexible substrate arranged that between the 1st case and the 2nd case should electrically be connected, and to a flexible substrate. By forming the 1st winding part wound on the axis of the 1st rotating shaft, and the 2nd winding part wound on the axis of the 2nd rotating shaft, Since the 1st winding part and the 2nd winding part of a flexible substrate only operate in the direction to which the direction or path to which the path of each winding part is reduced is expanded even if it is a case where the 1st case of electronic equipment rotates to the 2nd case, The load by bending is not applied to a flexible substrate, but breakage of a flexible substrate, etc. can be prevented.

[0047]According to the biaxial hinge device concerning claim 2, in the position corresponding to each center of the 1st winding part and the 2nd winding part. The 1st flat part and the 2nd flat part are provided, and the piece of the 1st winding and the piece of the 2nd winding which are bent in the direction which intersects perpendicularly from the extending direction of the 1st flat part and the 2nd flat part are provided, Since the 1st winding part and the 2nd winding part are formed when the piece of the 1st winding and the piece of the 2nd winding wind the circumference of the 1st flat part and the 2nd flat part, as [ arrange / to the part formed in midair on arranging a flexible substrate to the part which is not a shaft part of the 1st rotating shaft and the 2nd rotating shaft, i.e., the axis of each rotating shaft, / the winding part of a flexible substrate ] -- it becomes. For this reason, space efficiency is improved by arrangement of a flexible substrate, not applying load by bending to a flexible substrate, but preventing breakage etc.

[0048]According to the biaxial hinge device concerning claim 3, to the 1st flat part

and/or the 2nd flat part. Since the back up plate reinforced so that bending of a flexible substrate may be prevented is attached along the axial direction of the axis currently wound around the circumferencial direction, when forming the 1st winding part and/or the 2nd winding part, the piece of the 1st winding and the piece of the 2nd winding can be easily twisted around the circumference of a top view. Intensity maintenance can also be aimed at so that a winding part may not change after winding each winding part.

[0049]According to the biaxial hinge device according to claim 4, the back up plate, Since it is characterized by being formed in the shape of an L character so that it may be attached over the 1st flat part and the 2nd flat part, since intensity maintenance of each winding part can be aimed at by a single member, it can contribute to reduction of part mark, and intensity maintenance of both winding parts can be further made into a still more positive thing. Since according to the biaxial hinge device according to claim 5 while is connected to the 1st case and 2nd case of a flexible substrate and the connector is provided in the end and the end of another side, shortening of assembly time can be aimed at in an assembly of the electronic equipment using the biaxial hinge concerned.

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## TECHNICAL PROBLEM

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[Problem(s) to be Solved by the Invention]However, if it is when a biaxial hinge which has been mentioned above is used in electronic equipment, By rotating each case of electronic equipment repeatedly, the flexible substrate which electrically connects was bent repeatedly and the technical problem that there was a possibility that intensity may deteriorate and a flexible substrate may be damaged occurred.

[0004]In recent years, the fold-up formula cellular phone which made the screen portion and the ten key portion foldable is increasing rapidly by using as a different body the body part which has a screen portion and a ten key portion. what is established [ the screen portion of this fold-up formula cellular phone ] for a biaxial hinge -- a rear surface -- the model provided pivotable has also been considered. In such a cellular phone, the wiring which connects a screen portion and the body part which has a ten key portion turns into more [ far ] wiring than the case where the monitor display and the main part in a video camera are connected. When a biaxial hinge device is used for such a cellular phone, it is necessary for it to use a broad flexible substrate with many wiring numbers. Rather than the time of adopting a biaxial hinge as a video camera, in this case, the handling of a flexible substrate is still more



difficult, and not to mention the breakage prevention of a flexible substrate, The technical problem that it was necessary to store with sufficient space efficiency in a biaxial hinge so that it may not become the obstacle of rotation of a screen portion occurred.

[0005]Then, there is a place which this invention is made that an aforementioned problem should be solved and is made into the purpose in providing the biaxial hinge device which prevents breakage etc. of the flexible substrate of the electronic equipment which uses a biaxial hinge, and makes an electrical link a positive thing.

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## MEANS

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[Means for Solving the Problem]Namely, so that according to the biaxial hinge device concerning this invention it may have the 1st case and 2nd case and said 1st case may become rotatable focusing on an axis of the 1st rotating shaft to said 2nd case, And in a biaxial hinge device used for electronic equipment formed so that the 1st case might become rotatable focusing on an axis of the 2nd rotating shaft prolonged in the direction which intersects perpendicularly with an axial direction of said 1st rotating shaft to the 2nd case, Provide a flexible substrate arranged that between said 1st case and said 2nd case should electrically be connected, and to this flexible substrate. It is characterized by forming the 1st winding part wound on an axis of said 1st rotating shaft, and the 2nd winding part wound on an axis of said 2nd rotating shaft. Even if it is a case where the 1st case of electronic equipment rotates to the 2nd case by adopting this composition focusing on an axis of the 1st rotating shaft, and an axis of the 2nd rotating shaft, Since the 1st winding part and the 2nd winding part only operate in the direction to which a direction or a path to which a path of each winding part is reduced is expanded, load by bending is not applied to a flexible substrate, but breakage of a flexible substrate, etc. can be prevented.

[0007]In a position corresponding to each center of said 1st winding part and said 2nd winding part. The 1st flat part and the 2nd flat part which are prolonged in an axial direction of a rotating shaft corresponding to each winding part are provided, The piece of the 1st winding and the piece of the 2nd winding which are bent in the direction which intersects perpendicularly from an extending direction of said 1st flat part and said 2nd flat part are provided, When this piece of the 1st winding and the piece of the 2nd winding wind the circumference of said 1st flat part and the 2nd flat part, said 1st winding part and the 2nd winding part are formed. According to this composition, it becomes possible to arrange a flexible substrate to a part which is not

a shaft part of the 1st rotating shaft and the 2nd rotating shaft, i.e., arrange a winding part of a flexible substrate to a part formed in midair on an axis of each rotating shaft. And space efficiency is improved by arrangement of a flexible substrate, preventing breakage etc. without applying load to a flexible substrate.

[0008]The back up plate reinforced so that bending of a flexible substrate may be prevented is attached to said 1st flat part and/or the 2nd flat part along an axial direction of an axis currently wound around a circumferencial direction. According to this composition, when forming the 1st winding part and/or the 2nd winding part, it can wind easily, and intensity maintenance can also be aimed at so that a winding part may not change after winding each winding part.

[0009]Since said back up plate is characterized by being formed in the shape of an L character so that it may be attached over said 1st flat part and the 2nd flat part, Since intensity maintenance of each winding part can be aimed at by a single member, it can contribute to reduction of part mark, and intensity maintenance of both winding parts can be further made into a still more positive thing. While is connected to the 1st case and 2nd case of said flexible substrate, and a connector may be made to be provided in an end and an end of another side.

[0010]

[Embodiment of the Invention]Hereafter, the suitable embodiment of this invention is described in detail based on an accompanying drawing. First, based on drawing 1 – drawing 3, an example of the electronic equipment using a biaxial hinge device is shown. An example of the electronic equipment explained here is a cellular phone. That is, this cellular phone 20 comprises the main part 22 in which the ten key portion was provided, and the indicator 24 in which the liquid crystal display was provided. The main part 22 and the indicator 24 are the 1st case or 2nd case said to a claim. The biaxial hinge device 30 is formed in the part which connects the main part 22 and the indicator 24.

[0011]Drawing 1 shows the place whose cellular phone 20 is a waiting state. As for the cellular phone 20, in the waiting state, the main part 22 and the indicator 24 are folded up so that the field 22a established for the ten key and the field 24a in which the liquid crystal display is provided may face mutually. When performing a telephone call etc., as shown in drawing 2, it talks over the telephone by opening the indicator 24 to the main part 22. Deployment of the indicator 24 is performed by rotating the indicator 24 focusing on the axis x of the 1st rotating shaft 32 of the biaxial hinge device 30.

[0012]This cellular phone 20 is formed rotatable focusing on the axis y of the rotating shaft (not shown) which has an axis in the direction which intersects the indicator 24

perpendicularly with the 1st rotating shaft 32 of the biaxial hinge device 30 as shown in drawing 3. In other words, the indicator 24 can carry out rear surface inversion of the field 24a in which it is rotatable as a center and the liquid crystal display is provided in the axis y parallel to the longitudinal direction of the cellular phone 20 to the main part 22.

[0013] Thus, when rear surface inversion of the indicator 24 can be carried out, it can be used now and a CCD camera etc. are attached to the indicator 24, for example by adopting the biaxial hinge device 30 as the folding mechanism of the foldaway cellular phone 20, even if it is, it comes to be able to make photography easy to carry out.

[0014] Based on (a 1st embodiment) next drawing 4 – drawing 8, a 1st embodiment of the biaxial hinge device used for the cellular phone as an example of electronic equipment which was mentioned above is described. Drawing 4 shows the perspective view of a biaxial hinge device, and the side view in which the assembly exploded view of a biaxial hinge device and drawing 6 saw the partial sectional view of the hinge, drawing 7 saw the development view of the flexible substrate, and, as for drawing 8, drawing 5 saw the winding part of the flexible substrate from the side. The biaxial hinge device 40 of a 1st embodiment is provided with the following.

Body part 41.

The two hinges 42 rotated focusing on the axis x to this body part 41.

The hinge 44 which has the axis y in the direction which intersects perpendicularly with the axis x direction of the hinge 42, and is rotated focusing on the axis y.

The flexible substrate 50 is arranged through the axis x direction and the axis y direction in this body part 41. One end 50a of the flexible substrate 50 is connected to one case of electronic equipment. And the end 50b of another side is rotatable so that it folds up to one case of electronic equipment (or deployment), and it may be possible and rear surface inversion may be carried out, and also it is connected to the case of a way.

[0015] The fitting part 45 for the body part 41 to attach the hinge 42 is formed in two places along the axis x. The fitting part 46 which can attach the hinge 44 is formed in the base 41a of the body part 41 which has connected two fitting part 45 comrades of the body part 41 along the axis y. The body part 41 is equipped with the covering 37. The fitting part 46 carries out prescribed distance projection to the axis y direction which intersects perpendicularly with an axis x direction from the base 41a, and it is formed so that the hinge 44 may be attached in the direction which intersects perpendicularly on the flat surface of the base 41a. Between the fitting part 46 and the base 41a, the attachment arm part 82 of the shape which cut cylindrical [ a part

of ], and lacked and formed it is formed. The winding part 54 of the flexible substrate 50 mentioned later is stored by the attachment arm part 82.

[0016]In this embodiment, the hinge 42 and the hinge 44 have adopted the thing of the same structure. The 1st member 43 and the 2nd member 39 are arranged along the respectively same axial direction, it is attached and the hinges 42 and 44 are constituted so that rotation may become free focusing on an axis mutually. When it explains still in detail, the 2nd member 39 of the hinges 42 and 44, The body 71 by which the inside was formed in the centrum 73 as shown in drawing 6, and the shaft 70 by which the end has been arranged rotatable to the body 71 in the centrum 73 of the body 71, Leave the crevice h to the body 71 and it is arranged at the 1st member 43 side, and the movable cam plate 74 and \*\* are provided in the axial direction of the shaft 70 so that it may not rotate to the body 71.

[0017]The 1st member 43 is provided with the following.

The cam 76 which the other end of the shaft 70 is being fixed and has a click function held by a halt condition to the cam plate 74 in a prescribed position.

The fit part 78 attached to the fitting part 45 of the body part 41.

It applies to the 2nd member 39 from the 1st member 43, and the compression spring 80 is formed in the circumference of the shaft 70. It is compressed and equipped with the compression spring 80 between the cam plate 74 and the upper bed part of the body 71, and he is trying to always push the cam plate 74 against the cam 76. Two or more projections (not shown) which project towards cam 76 direction are provided in the cam plate 74, and two or more crevices (not shown) arranged in the projection of the cam plate 74 at the position which can be stored, respectively are established in the cam 76.

[0018]Operation in case the 2nd member 39 rotates to the part I material 43 is explained. If the 2nd member 39 rotates to the 1st member 43, the cam plate 74 pressed by the compression spring 80 contacting the cam 76, predetermined torque will arise with the cam plate 74 pressed by the compression spring 80 at the time of rotation. moreover -- a projection gets into a crevice between the cam plate 74 and the cam 76 -- being crowded (stored) -- if the thrust of the compression spring 80 is resisted and the cam plate 74 is not moved in the move direction of the compression spring 80, the shaft 70 stops rotating For this reason, rotation of the shaft 70 is maintained by the stop state in this position. Thus, the click action which rotational operation suspends in the position which the projection of the cam plate 74 gets into the crevice of the cam 76, and is crowded is realizable.

[0019]The 1st member 43 of such hinges 42 and 44 is attached to the fitting part 45

or 46 of the body part 41. The fit part 78 is inserted as a slip off stop into the attaching hole 81 of each fitting parts 45 and 46, and the engaging projection 47 formed in the fitting parts 45 and 46 can be inserted in to the slot 49 formed in the 1st member 43, and the attachment to the fitting parts 45 and 46 of the part I material 43 is fixed. Therefore, if each hinges 42 and 44 are attached to the body part 41, the body part 41 will become rotatable as a center about each axes x and y to the 2nd member 39.

[0020]Next, a flexible substrate is explained. The two winding parts 52 and 54 which the flexible substrate 50 rolled self and were formed are formed. The winding part 52 is formed so that it may wind around the hoop direction of the circle centering on the axis x on the axis x, and it forms one winding part 54 so that it may wind around the hoop direction of the circle centering on the axis y on the axis y. In other words, the winding parts 52 and 54 draw a round shape on each circumference of the axes x and y mostly focusing on each hinge 42 and the axes x and y of rotation of 44, round off the flexible substrate 50, and are formed. This winding part 52 is arranged among both the fitting parts 45 and 45 of the body part 41, and corresponds to rotation centering on the axis x of the hinge 42. And one winding part 54 is arranged between the base part 41a and the fitting part 46, and corresponds to rotation centering on the axis y of the hinge 44.

[0021]The structure of the flexible substrate 50 is explained based on drawing 7 which is the top view which developed and extended both the winding parts 52 and 54 of the flexible substrate 50. The point which the flexible substrate 50 can form copper foil in thin films, such as polyimide, can use it as a wiring board, and can be bent freely is the feature. The flexible substrate 50 adopted as this embodiment is provided with the following.

The flat part 55 arranged along the axis x of the rotating shaft of the hinge 42 of the biaxial hinge device 40.

The flat part 57 arranged along the axis y of the rotating shaft of the hinge 44.

Since they aim to intersect perpendicularly mutually, the axes x and y are formed so that the flat part 55 and the flat part 57 may also intersect perpendicularly mutually, double the flat part 55 and the flat part 57, and are formed as the plane view L character-like angle part 59.

[0022]The L in all character-like back up plate 60 is stuck on the surface by adhesives etc. in the shape of the angle part 59 at the angle part 59 which doubled the flat part 55 and the flat part 57. The back up plate 60 specifically comprises glass epoxy etc. The back up plate 60 is fixed to plate-like so that the flat part 55 and the

flat part 57 which were attached may not be bent or it may not be twisted.

[0023]From the end of the flat part's 57 connection side of the flat part 55, and an opposite hand, the piece 62 of winding prolonged towards the direction which intersects perpendicularly with the axis x is formed. (Referring to the arrow A of drawing 7) and the winding part 52 are formed by rolling it focusing on the flat part 55, as this piece 62 of winding twists. On the other hand, from the end of the connection side with the flat part 55 of the flat part 57, and an opposite hand, the piece 64 of winding prolonged towards the direction which intersects perpendicularly with the axis y is formed. (Referring to the arrow B of drawing 7) and the winding part 54 are formed by rolling it focusing on the flat part 57, as this piece 64 of winding twists.

[0024]As shown in drawing 7, by forming, as the winding parts 52 and 54 were mentioned above, it extends in an axis x direction, and the flat part 55 arranged so that it may become parallel to this x-y flat surface on an axis x-y flat surface is located at the center of the winding part 52 by it. Similarly, it extends in an axis y direction and the flat part 57 arranged so that it may become parallel to this x-y flat surface on an axis x-y flat surface is located at the center of the winding part 54.

[0025]Next, arrangement within the biaxial hinge of both winding parts is explained. The winding part 52 is located in the space part 89 formed between the two hinges 42 and 42 with which the center of winding forms the axis x. The space part 89 is a portion of the hollow formed between the two fitting parts 45 in the body part 41. Thus, the winding part 52 is arranged on the axis x at a position in the air. Since the flat part 55 to which the back up plate 60 was attached consists in the center of the winding part 52 at this time, even if arranged in the space part 89, what the winding part 52 shifted from on the axis x, or the volume of the piece 62 of winding loosens and carries out it, and said it relaxedly can be prevented.

[0026]On the other hand, the winding part 54 is laid on the attachment arm part 82 formed between the base 41a and the fitting part 46 so that the center of winding may become the axis y top of the hinge 44. However, since this attachment arm part 82 is what is formed in order to attach the fitting part 46 to the base 41a, this attachment arm part 82 does not need to exist for the winding part 54. Since the flat part 57 to which the back up plate 60 was attached consists in the center of the winding part 54 at this time, even if only laid on the attachment arm part 82, what the winding part 54 shifted from on the axis y, or the volume of the piece 64 of winding loosens and carries out it, and said it relaxedly can be prevented.

[0027]The place which equipped the cellular phone 20 shown in drawing 1 - drawing 3 with the biaxial hinge device of a 1st embodiment mentioned above is shown in

drawing 9 and drawing 10. At drawing 9, the place which attached the hinge 44 to the indicator 24 of the cellular phone 20 is shown, and drawing 10 shows the place which equipped the hinge applied part 84 of the main part 22 of the cellular phone 20 with the hinge 42. Here, the both ends 50a and 50b of the flexible substrate 50 are equipped with the connectors 126a and 126b for connecting with both the cases 22 and 24 of the cellular phone 20, respectively. Within the indicator 24, the hinge 44 is fixed in the indicator 24 and the body part 41 of the biaxial hinge device 40 is held rotatable focusing on the axis y to the indicator 24. The hinge 42 is fixed to the hinge applied part 84 of the main part 22. For this reason, the body part 41 of the biaxial hinge device 40 is held rotatable focusing on the axis x to the main part 22 of a cellular phone.

[0028]In (a 2nd embodiment), next the biaxial hinge device of this invention, a 2nd embodiment that has a different gestalt from a 1st embodiment mentioned above is described based on drawing 11 – drawing 13. The numerals same about the same component as a 1st embodiment mentioned above may be attached, and explanation may be omitted.

[0029]Drawing 11 shows the perspective view of a biaxial hinge device, drawing 12 shows the assembly exploded view of a biaxial hinge device, and Drawing 147 shows the development view of the flexible substrate. The hinge 42 as the embodiment which mentioned the 1st rotating shaft above unlike a 1st embodiment with same point of having provided the shaft which the biaxial hinge device 90 of a 2nd embodiment is open for free passage to the case and biaxial hinge device of electronic equipment, and is arranged in the 2nd rotating shaft is adopted. Here, the both ends 100a and 100b of the flexible substrate 100 are equipped with the connectors 126a and 126b, respectively.

[0030]This biaxial hinge device 90 is provided with the following.

Body part 91.

The two hinges 42 rotated focusing on the axis x to this body part 91.

The hinge unit 94 which has the axis y in the direction which intersects perpendicularly with the axis x direction of the hinge 42, and rotates focusing on the axis y.

The flexible substrate 100 is arranged through the axis x direction and the axis y direction in this body part 91. One end 100a of the flexible substrate 100 is connected to one case of electronic equipment. And the end 100b of another side is folded up to one case of electronic equipment (or deployment), it is possible, and is rotatable to rear surface reverse, and also it is connected to the case of a way.

[0031]The fitting part 95 for attaching the hinge 42 to the body part 91 is formed in two places along the axis x. The fitting part 96 to which the screw stop of the hinge unit 94 is carried out is formed in the body part 91. Specifically, the fitting part 96 comprises the attaching part 110 of the screw hole 99 which carries out the screw stop of the hinge unit 94, and the shape of half-segmented [ which hold the hinge unit 94 together with the covering 97 of the body part 91 ].

[0032]The hinge unit 94 is explained. In between the bracket 111 with which the hinge unit 94 is fixed to the body part 91, the bracket 112 fixed to the 2nd case of electronic equipment, and the brackets 111 and the brackets 112, One end is fixed to the bracket 111 and the other end is \*\* constituted with the shaft 115 attached to the bracket 112 rotatable via the click board 114.

[0033]If rotation of the shaft 115 becomes a predetermined angle, the click board 114 is formed so that rotation may stop with this predetermined angle. The energization board 116 which has the projection 117 which projects towards the side in which the click board 114 is located is formed in the bracket 112. The energization board 116 is energized so that it may always project in the click board 114 direction, and it is formed as the projection 117 always touches the click board 114. On the other hand, the notch 118 which can store the height 117 is formed in the click board 114.

[0034]The click function of the hinge unit 94 is explained. If the shaft 115 is rotated, in the projection 117, in slide contact with the click board 114, predetermined torque will occur in rotation of the shaft 115. furthermore — the projection 117 fits into the notch 118 of the click board 114 — being crowded (stored) — since the shaft 115 stops rotating if the energizing force of the energization board 116 is resisted and the projection 117 is not depressed, rotation of a shaft is maintained by the stop state in this position.

[0035]Next, the flexible substrate of a 2nd embodiment is explained. The winding part 102 which the flexible substrate 100 rolled self and formed it, and the winding part 104 which twisted around the circumference of the shaft 115 and was formed are formed. That is, the winding part 102 is formed so that it may wind around the hoop direction of the circle centering on the axis x on the axis x, and it forms one winding part 104 so that it may wind around the hoop direction of the circle centering on the axis y on the axis y. In other words, focusing on the axes x and y of rotation of the flexible substrate 100 of the hinge 42 and the hinge unit 94, the winding part 102,104 draws a round shape on each circumference of the axes x and y mostly, rounds off to it, and is formed in it. This winding part 102 is arranged among both the fitting parts 45 and 45 of the body part 91, and corresponds to rotation centering on the axis x of the hinge



42. And one winding part 104 corresponds to rotation centering on the axis y of the shaft 115 of the hinge unit 94.

[0036]The structure of the flexible substrate 100 is explained based on drawing 13 which is the top view which developed and extended both the winding parts 102,104 of the flexible substrate 100. The flexible substrate 100 adopted as this embodiment is provided with the following.

The flat part 105 arranged along the axis x of the rotating shaft of the hinge 42 of the biaxial hinge device 90.

The flat part 107 arranged along the axis y of the rotating shaft of the hinge unit 94. Since the axes x and y aim to intersect perpendicularly mutually, it is formed so that the flat part 105 and the flat part 107 may also intersect perpendicularly mutually.

[0037]The back up plate 120 is stuck on the surface by adhesives etc. at the flat part 105. The back up plate 120 comprises glass epoxy etc., as mentioned above. The back up plate 120 is fixed to plate-like so that the attached flat part 105 may not be bent or it may not be twisted.

[0038]From the end of the flat part's 107 connection side of the flat part 105, and an opposite hand, the piece 122 of winding prolonged towards the direction which intersects perpendicularly with the axis x is formed. (Referring to the arrow A of drawing 13) and the winding part 102 are formed by rolling it focusing on the flat part 105, as this piece 122 of winding twists. On the other hand, from the end of the connection side with the flat part 105 of the flat part 107, and an opposite hand, the piece 124 of winding prolonged towards the direction which intersects perpendicularly with the axis y is formed. (Referring to the arrow B of drawing 13) and the winding part 104 are formed by this piece 124 of winding being wound around the circumference of the shaft 115 of the hinge unit 94.

[0039]By forming, as the winding part 102 was mentioned above, it extends in an axis x direction, and the flat part 105 arranged so that it may become parallel to this x-y flat surface on an axis x-y flat surface is located at the center of the winding part 102 by it (refer to drawing 13).

[0040]Next, arrangement within the biaxial hinge of both winding parts is explained. The winding part 102 is located in the space part 89 formed between the two hinges 42 and 42 with which the center of winding forms the axis x. The space part 89 is a portion of the hollow formed between the two fitting parts 45 in the body part 91. Thus, the winding part 102 is arranged on the axis x at a position in the air. Since the flat part 105 to which the back up plate 120 was attached consists in the center of the winding part 102 at this time, even if arranged in the space part 89, what the winding

part 102 shifted from on the axis x, or the volume of the piece 122 of winding loosens and carries out it, and said it relaxedly can be prevented.

[0041]On the other hand, since the piece 124 of winding is wound around the circumference of the shaft 115 which is the axis y of the rotating shaft of the hinge unit 94, the winding part 104 can prevent what the winding part 104 shifted from on the axis y, or the volume of the piece 124 of winding loosens and carries out it, and said it relaxedly.

[0042]The place which equipped the cellular phone 20 shown in drawing 1 - drawing 3 with the biaxial hinge device of a 1st embodiment mentioned above is shown in drawing 14 and drawing 15. At drawing 14, the place which attached the hinge unit 94 to the indicator 24 of the cellular phone 20 is shown, and drawing 15 shows the place which equipped the hinge applied part 84 of the main part 22 of the cellular phone 20 with the hinge 42. Within the indicator 22, the hinge unit 94 is fixed in the indicator 24, and the body part 91 of the biaxial hinge device 90 is held rotatable focusing on the axis y to the indicator 24. The hinge 42 is fixed to the hinge applied part 84 of the main part 22. For this reason, the body part 91 of the biaxial hinge device 90 is held rotatable focusing on the axis x to the main part 22.

[0043]Two embodiments mentioned above have explained the example about the biaxial hinge device mainly used for a cellular phone. However, the biaxial hinge device of this invention is not limited to what is used for a cellular phone, and may be used for other electronic equipment.

[0044]It is suitable, even if it is not limited to what the gestalt of a hinge has mentioned above as composition of a biaxial hinge device and adopts other hinges or hinge units of a gestalt. Even if it is a case where the hinge 42 mentioned above is adopted, it is good also as composition which forms only the one hinge 42 along an axis x direction.

[0045]As for this invention, although the suitable example was given per this invention above and many things were explained, it is needless to say that many can be changed within limits which are not limited to this example and do not deviate from the pneuma of an invention.

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## DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1]It is an explanatory view showing the place folded up in the cellular phone using the biaxial hinge device concerning this invention.

[Drawing 2]It is an explanatory view showing the place which opened the indicator of the cellular phone shown in drawing 1.

[Drawing 3]It is an explanatory view showing the place which carries out rear surface inversion of the indicator of the cellular phone shown in drawing 1.

[Drawing 4]It is a perspective view showing the composition of a 1st embodiment of the biaxial hinge device concerning this invention.

[Drawing 5]It is an assembly exploded view showing the parts constitution of a 1st embodiment of the biaxial hinge device concerning this invention.

[Drawing 6]It is a partial sectional view of the hinge explaining the structure of a hinge.

[Drawing 7]It is a flat part explaining the gestalt of a flexible substrate of a flexible substrate.

[Drawing 8]It is a side view of the winding part explaining the structure of the winding part of a flexible substrate.

[Drawing 9]It is an explanatory view showing the place which attaches the biaxial hinge device of a 1st embodiment to a cellular phone.

[Drawing 10]It is an explanatory view showing the place which attaches the biaxial hinge device of a 1st embodiment to a cellular phone.

[Drawing 11]It is a perspective view showing the composition of a 1st embodiment of the biaxial hinge device concerning this invention.

[Drawing 12]It is an assembly exploded view showing the parts constitution of a 2nd embodiment of the biaxial hinge device concerning this invention.

[Drawing 13]It is a flat part explaining the flexible substrate of a 2nd embodiment of a flexible substrate.

[Drawing 14]It is an explanatory view showing the place which attaches the biaxial hinge device of a 2nd embodiment to a cellular phone.

[Drawing 15]It is an explanatory view showing the place which attaches the biaxial hinge device of the 12th applied configuration to a cellular phone.

[Description of Notations]

20 Cellular phone

22 Main part

24 Indicator

37 and 97 Covering

39 The 2nd member

30, 40, 90 biaxial hinge device

41 and 91 Body part

41a \*\*--SU

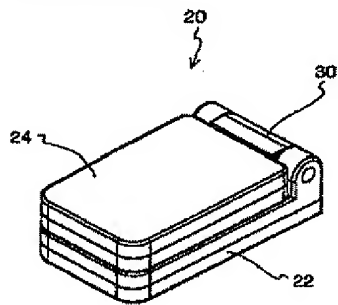
42 and 44 Hinge  
43 The 1st member  
45 and 46 Fitting part  
47 Engaging projection  
49 Slot  
50 Flexible substrate  
52 and 54,102,104 Winding part  
55 and 57,105,107 Flat part  
59 Angle part  
60 Back up plate  
62 and 64,122,124 Piece of winding  
70 Shaft  
71 Body  
73 Centrum  
74 Cam plate  
76 Cam  
78 Fit part  
80 Compression spring  
81 Attaching hole  
84 Hinge applied part  
94 Hinge unit  
99 Screw hole  
100 Flexible substrate  
110 Attaching part  
111,112 Bracket  
114 Click board  
115 Shaft  
116 Energization board  
117 Height  
118 Notch  
126 Connector

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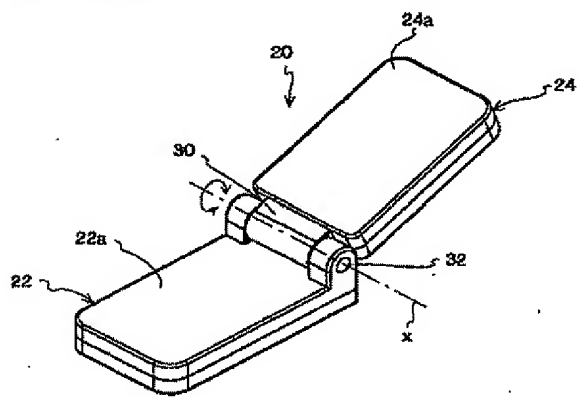
## DRAWINGS

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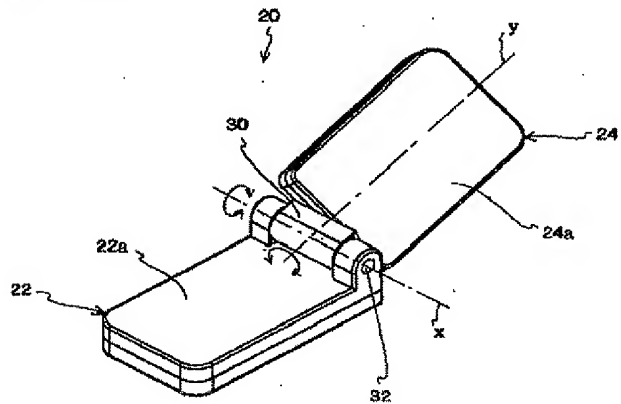
[Drawing 1]



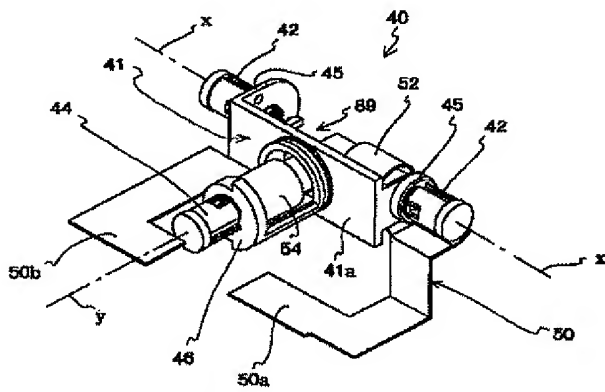
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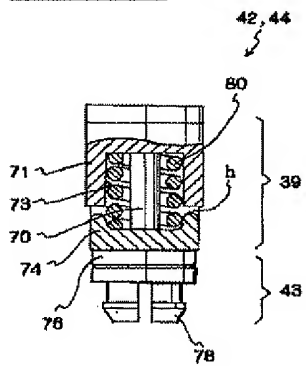
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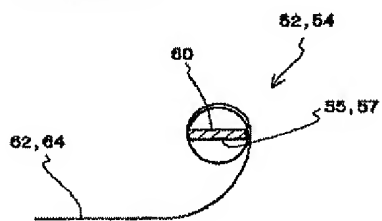
[Drawing 4]



[Drawing 6]

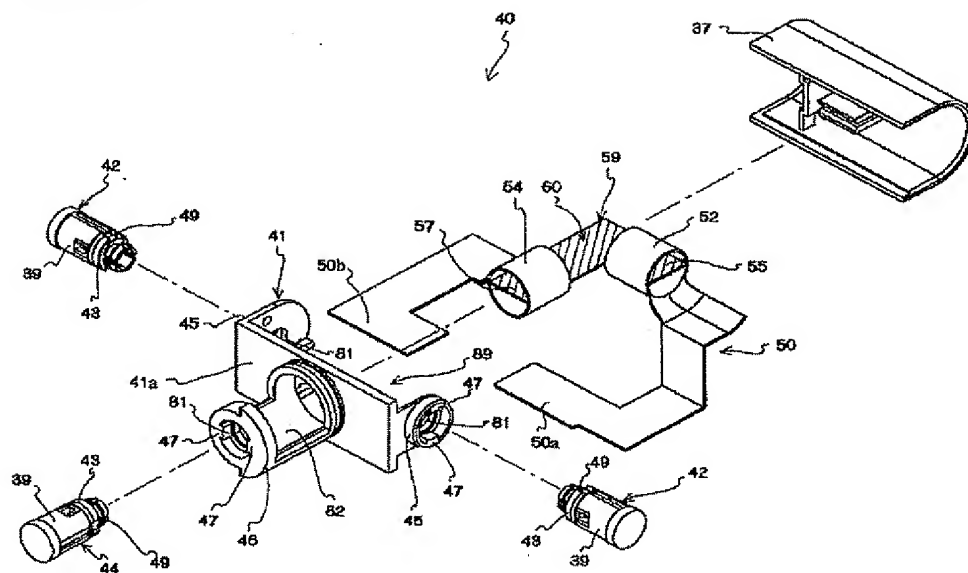


[Drawing 8]



[Drawing 9]

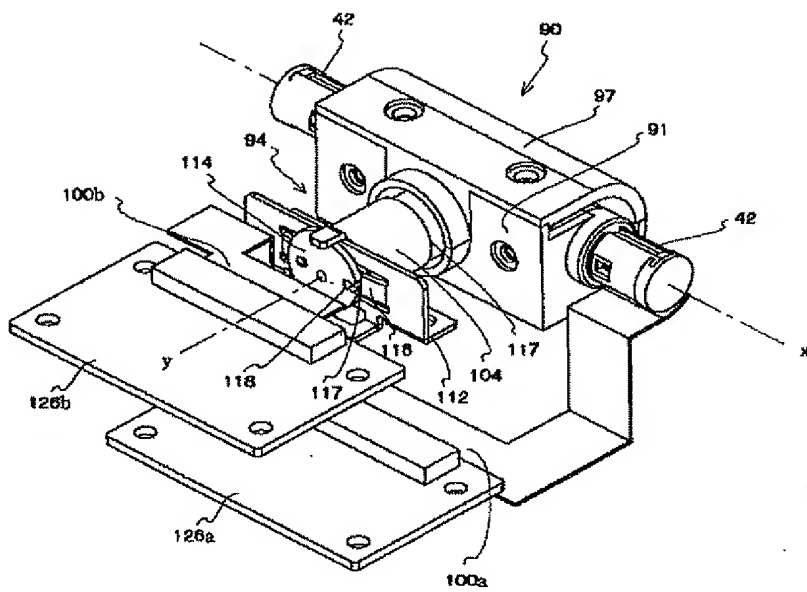
[Drawing 5]



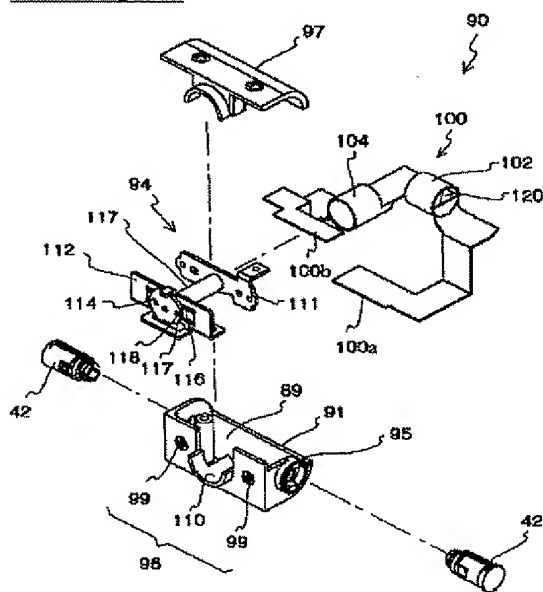
[Drawing 7]



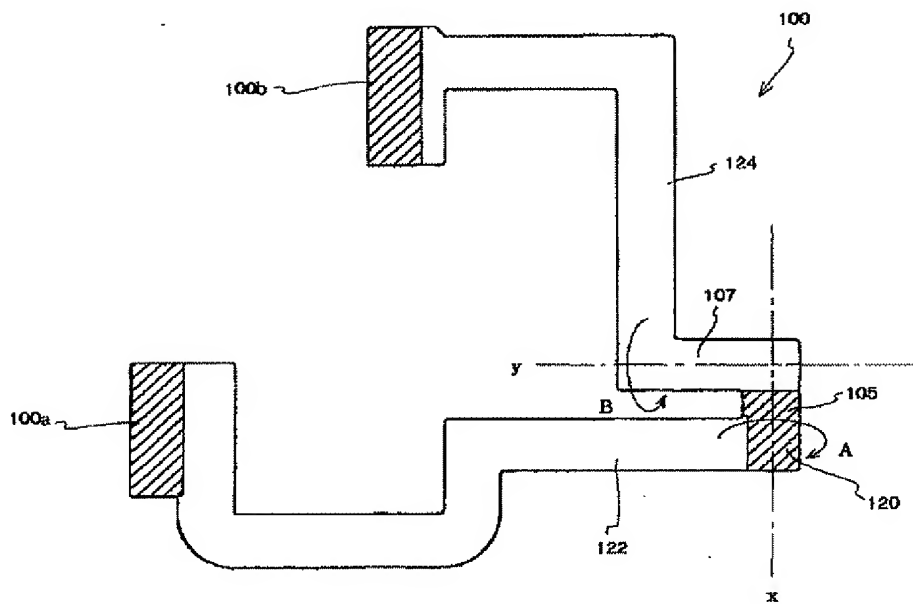




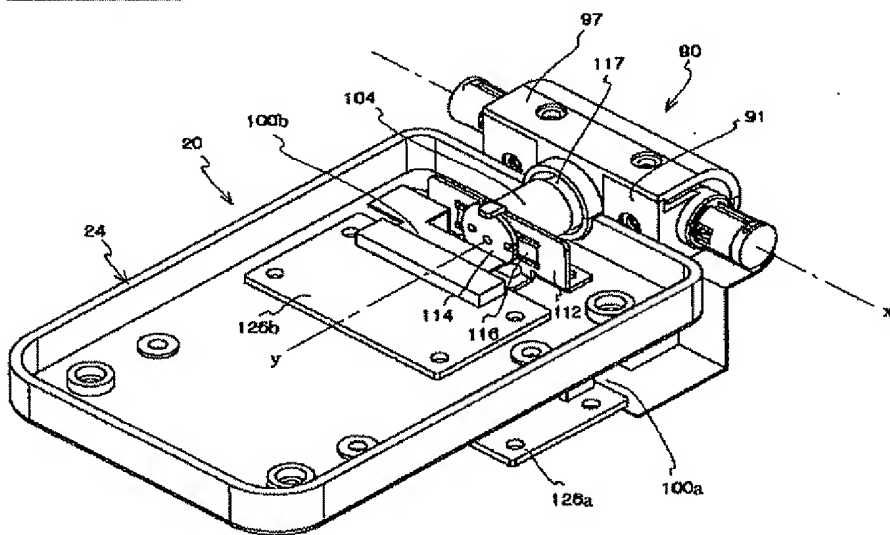
[Drawing 12]



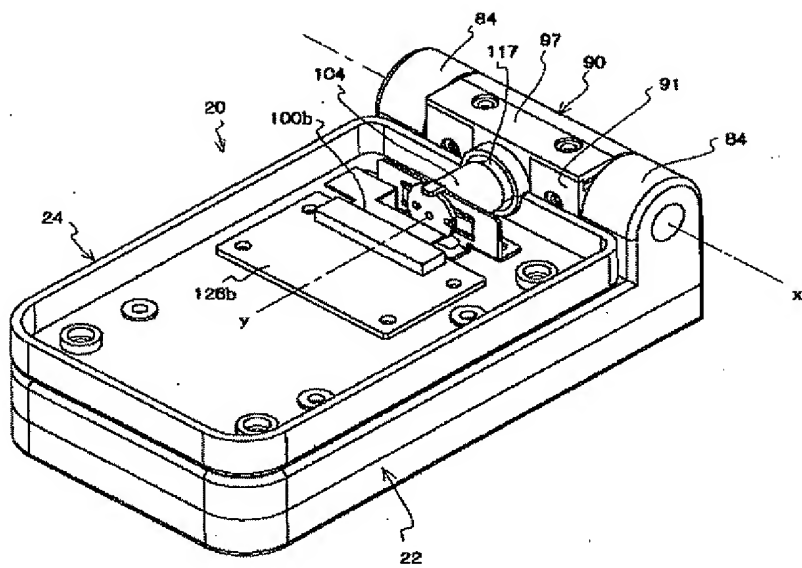
**[Drawing 13]**



[Drawing 14]



[Drawing 15]



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[Translation done.]



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H 0 5 K 5/02

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5/03

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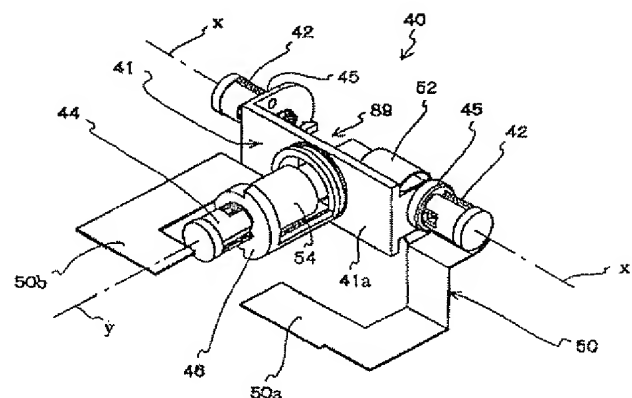
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(54) 【発明の名称】 2軸ヒンジ装置

(57) 【要約】

【課題】 2軸ヒンジを用いる電子機器のフレキシブル基板の破損等を防止して電氣的接続を確実なものとする2軸ヒンジ装置を提供する。

【解決手段】 第1の筐体24と第2の筐体22とを有し、第1の筐体24が第2の筐体22に対して第1の回動軸42の軸線xを中心に回動可能となるように、且つ第1の筐体24が第2の筐体22に対して第1の回動軸42の軸線x方向と直交する方向に延びる第2の回動軸44の軸線yを中心に回動可能となるように設けられた電子機器に用いられる2軸ヒンジ装置40において、第1の筐体24と第2の筐体22との間を電氣的に接続すべく配置されているフレキシブル基板50を具備し、フレキシブル基板50には、第1の回動軸42の軸線x上に巻回された第1巻回部52と、第2の回動軸44の軸線y上に巻回された第2巻回部54とが形成されていることを特徴とする。



## 【特許請求の範囲】

【請求項 1】 第 1 の筐体と第 2 の筐体とを有し、前記第 1 の筐体が前記第 2 の筐体に対して第 1 の回動軸の軸線を中心に回動可能となるように、且つ第 1 の筐体が第 2 の筐体に対して前記第 1 の回動軸の軸線方向と直交する方向に延びる第 2 の回動軸の軸線を中心に回動可能となるように設けられた電子機器に用いられる 2 軸ヒンジ装置において、

前記第 1 の筐体と前記第 2 の筐体との間を電氣的に接続すべく配置されているフレキシブル基板を具備し、該フレキシブル基板には、前記第 1 の回動軸の軸線上に巻回された第 1 巻回部と、前記第 2 の回動軸の軸線上に巻回された第 2 巻回部とが形成されていることを特徴とする 2 軸ヒンジ装置。

【請求項 2】 前記第 1 巻回部および前記第 2 巻回部の各中心に対応する位置には、各巻回部に対応する回動軸の軸線方向に延びる第 1 平板部および第 2 平板部が設けられ、

前記第 1 平板部および前記第 2 平板部の延出方向から直交する方向に曲折して形成された第 1 巻回片および第 2 巻回片が設けられ、

該第 1 巻回片および第 2 巻回片が前記第 1 平板部および第 2 平板部の周囲を巻回することによって前記第 1 巻回部および第 2 巻回部とが形成されていることを特徴とする請求項 1 記載の 2 軸ヒンジ装置。

【請求項 3】 前記第 1 平板部および／または第 2 平板部には、円周方向に巻回している軸線の軸線方向に沿って、フレキシブル基板の折曲を防止するように補強する補強板が取り付けられていることを特徴とする請求項 2 記載の 2 軸ヒンジ装置。

【請求項 4】 前記補強板は、前記第 1 平板部と第 2 平板部にわたって取り付けられるように L 字状に形成されていることを特徴とする請求項 3 記載の 2 軸ヒンジ装置。

【請求項 5】 前記フレキシブル基板の、第 1 の筐体および第 2 の筐体に接続される一方の端部および他方の端部にはコネクタが設けられていることを特徴とする請求項 1、2、3 または 4 記載の 2 軸ヒンジ装置。

## 【発明の詳細な説明】

## 【0001】

【発明の属する技術分野】 本発明は、2 つ以上の筐体が 2 つの軸で回動可能に設けられている電子機器、特に折り畳み式携帯電話や、モニタ画面を展開可能なビデオカメラ等において使用される 2 軸ヒンジ装置に関する。

## 【0002】

【従来の技術】 近年、ビデオカメラなどの電子機器においては、モニタ画面などが本体から展開し、且つこのモニタ画面が表裏反転するような構造のものが開発されている。このような電子機器においては、互いに直交する 2 方向に 2 本の回動軸を有する 2 軸ヒンジ装置が用いら

れ、この 2 軸ヒンジ装置内にはモニタ画面と本体とを配線するためのフレキシブル基板が設けられている。

## 【0003】

【発明が解決しようとする課題】 しかし、電子機器において、上述してきたような 2 軸ヒンジを用いた場合には、電子機器の各筐体を何度も回動させることにより、電氣的に接続するフレキシブル基板が何度も折り曲げられ、強度が劣化してフレキシブル基板が破損してしまうというおそれがあるという課題があった。

【0004】 また近年では、画面部分と、テンキー部分とを有する本体部分とを別体として、画面部分とテンキー部分とを折畳み可能とした折畳み式携帯電話が急増している。さらに、この折畳み式携帯電話の画面部分を 2 軸ヒンジを設けることによって表裏回転可能に設けた機種も考えられてきている。このような携帯電話において、画面部分と、テンキー部分を有する本体部分とを接続する配線は、ビデオカメラにおけるモニタ画面と本体とを接続する場合よりもはるかに多い配線となる。このような携帯電話に、2 軸ヒンジ装置を用いた場合には、配線数が多い幅広のフレキシブル基板を用いることが必要となってくる。かかる場合には、ビデオカメラに 2 軸ヒンジを採用したときよりもさらにフレキシブル基板の取り扱いが難しく、フレキシブル基板の破損防止はもちろんのこと、画面部分の回動の邪魔にならないようにスペース効率よく 2 軸ヒンジ内に収納する必要があるという課題があった。

【0005】 そこで、本発明は上記課題を解決すべくなされ、その目的とするところは、2 軸ヒンジを用いる電子機器のフレキシブル基板の破損等を防止して電氣的接続を確実なものとする 2 軸ヒンジ装置を提供することにある。

## 【0006】

【課題を解決するための手段】 すなわち、本発明にかかる 2 軸ヒンジ装置によれば、第 1 の筐体と第 2 の筐体とを有し、前記第 1 の筐体が前記第 2 の筐体に対して第 1 の回動軸の軸線を中心に回動可能となるように、且つ第 1 の筐体が第 2 の筐体に対して前記第 1 の回動軸の軸線方向と直交する方向に延びる第 2 の回動軸の軸線を中心に回動可能となるように設けられた電子機器に用いられる 2 軸ヒンジ装置において、前記第 1 の筐体と前記第 2 の筐体との間を電氣的に接続すべく配置されているフレキシブル基板を具備し、該フレキシブル基板には、前記第 1 の回動軸の軸線上に巻回された第 1 巻回部と、前記第 2 の回動軸の軸線上に巻回された第 2 巻回部とが形成されていることを特徴としている。この構成を採用することによって、第 1 の回動軸の軸線および第 2 の回動軸の軸線を中心にして、電子機器の第 1 の筐体が第 2 の筐体に対して回動した場合であっても、第 1 巻回部および第 2 巻回部が、各巻回部の径が縮小される方向または径が拡大される方向に作動するだけであるので、フレキシ

ブル基板に折曲による負荷がかからずフレキシブル基板の破損等を防止することができる。

【0007】また、前記第1巻回部および前記第2巻回部の各中心に対応する位置には、各巻回部に対応する回動軸の軸線方向に延びる第1平板部および第2平板部が設けられ、前記第1平板部および前記第2平板部の延出方向から直交する方向に曲折する第1巻回片および第2巻回片が設けられ、該第1巻回片および第2巻回片が前記第1平板部および第2平板部の周囲を巻回することによって前記第1巻回部および第2巻回部とが形成されていることを特徴とする。この構成によれば、第1の回動軸および第2の回動軸のシャフト部分ではない部位にフレキシブル基板を配置すること、つまり各回動軸の軸線上で中空に形成された部位にフレキシブル基板の巻回部を配置することが可能となる。そして、フレキシブル基板に負荷をかけずに破損等を防止しつつ、スペース効率よくフレキシブル基板の配置ができる。

【0008】さらに、前記第1平板部および／または第2平板部には、円周方向に巻回している軸線の軸線方向に沿って、フレキシブル基板の折曲を防止するように補強する補強板が取り付けられていることを特徴とする。この構成によれば、第1巻回部および／または第2巻回部を形成する際に巻回を容易に行なうことができ、各巻回部を巻回した後に巻回部が変形したりしないように強度維持も図ることができる。

【0009】なお、前記補強板は、前記第1平板部と第2平板部にわたって取り付けられるようにL字状に形成されていることを特徴とするので、各巻回部の強度維持を単一の部材で図ることができるので部品点数の削減に寄与し、さらに両巻回部の強度維持をさらに確実なものとすることができる。さらに、前記フレキシブル基板の、第1の筐体および第2の筐体に接続される一方の端部および他方の端部にはコネクタが設けられているようにしてもよい。

【0010】

【発明の実施の形態】以下、本発明の好適な実施の形態を添付図面に基づいて詳細に説明する。まず、図1～図3に基づいて、2軸ヒンジ装置を用いた電子機器の一例を示す。ここで説明する電子機器の一例は、携帯電話である。すなわち、この携帯電話20は、テンキー部分が設けられた本体22と、液晶画面が設けられた表示部24とから構成される。本体22と表示部24が特許請求の範囲にいう第1の筐体または第2の筐体である。2軸ヒンジ装置30は、本体22と表示部24とを連結する部位に設けられている。

【0011】図1は、携帯電話20が待機状態であるところを示している。携帯電話20は、待機状態のときには本体22と表示部24はテンキーが設けられている面22aと液晶画面が設けられている面24aとが互いに向かい合うように折り畳まれている。通話等を行なう際

には、図2に示すように本体22に対して表示部24を開いて通話を行なう。表示部24の展開は、2軸ヒンジ装置30の第1回動軸32の軸線xを中心に表示部24を回動させて行なう。

【0012】本携帯電話20は、図3に示すように表示部24を、2軸ヒンジ装置30の第1回動軸32に直交する方向に軸線を有する回動軸（図示せず）の軸線yを中心に回動可能に設けられている。言い換えると、表示部24は、携帯電話20の長手方向に平行な軸線yを中心として回動可能であって、液晶画面が設けられている面24aを本体22に対して表裏反転させることができるのである。

【0013】このように、折り畳み式の携帯電話20の折畳み機構に2軸ヒンジ装置30を採用することにより、表示部24を表裏反転させて使用することができるようになり、例えば表示部24にCCDカメラ等を取り付けた場合等にあっても写真撮影がしやすくなるようになる。

【0014】（第1実施形態）次に、図4～図8に基づいて、上述したような電子機器の一例としての携帯電話に用いた2軸ヒンジ装置の第1実施形態について説明する。図4は2軸ヒンジ装置の斜視図、図5は2軸ヒンジ装置の組立て分解図、図6はヒンジの一部断面図、図7はフレキシブル基板の展開図、図8はフレキシブル基板の巻回部を側面からみた側面図を示している。第1実施形態の2軸ヒンジ装置40は、本体部41と、該本体部41に対して軸線xを中心に回動する2つのヒンジ42と、ヒンジ42の軸線x方向と直交する方向に軸線yを有し、軸線yを中心に回動するヒンジ44とを具備している。この本体部41を軸線x方向および軸線y方向を通してフレキシブル基板50が配置されている。フレキシブル基板50の一方の端部50aは、電子機器の一方の筐体に接続される。そして、他方の端部50bは、電子機器の一方の筐体に対して折畳み（または展開）可能であって且つ表裏反転するように回動可能な他方の筐体に接続される。

【0015】本体部41は、ヒンジ42を取り付けるための取付部45が、軸線xに沿って2個所に形成されている。さらに、本体部41の2つの取付部45同士を連結している本体部41のベース41aには、軸線yに沿ってヒンジ44を取り付け可能な取付部46が形成されている。本体部41にはカバー37が装着される。取付部46は、ベース41aから軸線x方向と直交する軸線y方向へ所定距離突出して、ベース41aの平面上に直交する方向にヒンジ44が取り付けられるように形成されている。取付部46とベース41aとの間は、円筒の一部を切り欠いて形成した形状の取付けアーム部82が設けられている。取付けアーム部82には、後述するフレキシブル基板50の巻回部54が収納される。

【0016】なお、本実施形態ではヒンジ42とヒンジ

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44とは同一の構造のものを採用している。ヒンジ42, 44は、第1部材43と、第2部材39とがそれぞれ同一の軸線方向に沿って配置され、互いに軸線を中心に回動自在となるように取り付けられて構成されている。さらに詳細に説明すると、ヒンジ42, 44の第2部材39は、図6に示すように内部が中空部73に形成されたボディ71と、ボディ71の中空部73内にボディ71に対して回動可能に一端が配置されたシャフト70と、ボディ71に対して隙間hを空けて第1部材43側に配置されると共にボディ71に対しては回動しないよう且つシャフト70の軸線方向には移動可能なカムプレート74と、が設けられている。

【0017】また、第1部材43は、シャフト70の他端が固定されていると共に、カムプレート74に対して所定位置で停止状態で保持するクリック機能を有するカム76と、本体部41の取付部45に取付けられるフィット部78とを備えている。また、第1部材43から第2部材39にかけてシャフト70の周囲には、圧縮ばね80が設けられている。圧縮ばね80は、カムプレート74とボディ71の上端部との間で圧縮されて装着され、カムプレート74をカム76へ常時押しつけるようにしている。カムプレート74には、カム76方向へ向けて突出する複数の突起（図示せず）が設けられ、カム76にはカムプレート74の突起をそれぞれ収納可能な位置に配置された複数の凹部（図示せず）が設けられている。

【0018】第1部材43に対して第2部材39が回動するときの動作について説明する。圧縮ばね80に押圧されたカムプレート74がカム76に当接しつつ、第1部材43に対して第2部材39が回動すると、圧縮ばね80に押圧されたカムプレート74により回動時に所定のトルクが生じる。また、カムプレート74とカム76との間において突起が凹部にはまりこむ（収納される）と、圧縮ばね80の押圧力に抗して圧縮ばね80の移動方向にカムプレート74を移動させないとシャフト70が回動しなくなる。このため、この位置でシャフト70の回動が一旦停止状態に維持される。このようにして、カムプレート74の突起がカム76の凹部にはまりこむ位置で回動動作が一旦停止するクリック動作を実現できる。

【0019】このようなヒンジ42, 44の第1部材43は、本体部41の取付部45または46に取付けられる。第1部材43の取付部45, 46への取付けは、フィット部78が各取付部45, 46の取付穴81内に抜け止めとして挿入されると共に、取付部45, 46に形成された係合突起47が、第1部材43に形成された溝部49へ嵌め込められ固定される。したがって、各ヒンジ42, 44は、本体部41に取付けられると、第2部材39に対して本体部41が各軸線x, yを中心として回動可能となるのである。

【0020】次に、フレキシブル基板について説明する。フレキシブル基板50は、自身を巻いて形成した2つの巻回部52, 54が形成されている。巻回部52は、軸線x上で軸線xを中心とした円の周方向に巻くように形成しており、一方の巻回部54は、軸線y上で軸線yを中心とした円の周方向に巻くように形成している。言い換えると、巻回部52, 54は、フレキシブル基板50を各ヒンジ42, 44の回動の軸線x, yを中心として軸線x, yのそれぞれの周囲にほぼ円形を描いて丸めて形成されている。かかる巻回部52は本体部41の両取付部45, 45の間に配置され、ヒンジ42の軸線xを中心とした回動に対応する。そして、一方の巻回部54は、ベース部41aと取付部46との間に配置され、ヒンジ44の軸線yを中心とした回動に対応する。

【0021】フレキシブル基板50の両巻回部52, 54を展開して広げた平面図である図7に基づいて、フレキシブル基板50の構造について説明する。フレキシブル基板50は、ポリイミド等の薄膜に銅箔を形成して配線基板としたものであって、自由に曲げることができる点が特徴である。本実施形態に採用するフレキシブル基板50は、2軸ヒンジ装置40のヒンジ42の回動軸の軸線xに沿って配置される平板部55と、ヒンジ44の回動軸の軸線yに沿って配置される平板部57とを有している。軸線x, yは互いに直交する方向であるので、平板部55と平板部57も互いに直交するように形成され、平板部55と平板部57を合わせて平面視L字状のアングル部59として形成されている。

【0022】平板部55と平板部57を合わせたアングル部59には、アングル部59の形状に合わせてL字状の補強板60がその表面に接着剤等により貼り付けられている。補強板60は具体的にはガラスエポキシ等で構成されている。補強板60は、取り付けられた平板部55と平板部57とが曲げられたり捻られたりされないように、平板状に固定するものである。

【0023】平板部55の、平板部57の接続側と反対側の端部からは軸線xに直交する方向に向けて延びる巻回片62が形成されている。この巻回片62が、平板部55を中心に巻き付けるようにして巻かれていくことにより（図7の矢印A参照）、巻回部52が形成される。一方、平板部57の、平板部55との接続側と反対側の端部からは軸線yに直交する方向に向けて延びる巻回片64が形成されている。この巻回片64が、平板部57を中心に巻き付けるようにして巻かれていくことにより（図7の矢印B参照）、巻回部54が形成される。

【0024】巻回部52と54を上述したように形成することで、図7に示すように巻回部52の中心には、軸線x方向に延び、軸線x-y平面上で該x-y平面と平行となるように配置された平板部55が位置する。同様に巻回部54の中心には、軸線y方向に延び、軸線x-y

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y平面上で該x-y平面と平行となるように配置された平板部57が位置する。

【0025】次に両巻回部の2軸ヒンジ内での配置について説明する。巻回部52は、巻回部の中心が軸線xを形成する2つのヒンジ42、42の間に形成された空間部89に位置している。空間部89は、本体部41において2つの取付部45の間に形成された中空の部分である。このように巻回部52は、軸線x上で中空の位置に配置される。このとき巻回部52の中心には補強板60が取付けられた平板部55が存している。空間部89内に配置されていても、巻回部52は軸線x上からずれたり巻回片62の巻きがゆるんでしまったりといったようなことが防止できる。

【0026】一方、巻回部54は、巻線の中心がヒンジ44の軸線y上となるように、ベース41aと取付部46の間に形成された取付けアーム部82上に載置される。ただし、この取付けアーム部82は取付部46をベース41aに取付ける目的で形成されているものであるため、巻回部54にとってはこの取付けアーム部82は存在していなくともよい。このとき、巻回部54の中心には補強板60が取付けられた平板部57が存している。取付けアーム部82上に単に載置されているだけであっても、巻回部54は軸線y上からずれたり巻回片64の巻きがゆるんでしまったりといったようなことが防止できる。

【0027】図9および図10には、上述してきた第1実施形態の2軸ヒンジ装置を図1～図3に示した携帯電話20に装着したところを示している。図9ではヒンジ44を携帯電話20の表示部24に取付けたところを示し、図10ではヒンジ42を携帯電話20の本体22のヒンジ装着部84に装着したところを示している。なお、ここではフレキシブル基板50の両端部50a、50bには、それぞれ携帯電話20の両筐体22、24に接続するためのコネクタ126a、126bが装着されている。表示部24内ではヒンジ44が表示部24内に固定され、2軸ヒンジ装置40の本体部41は表示部24に対して軸線yを中心に回転可能に保持される。本体22のヒンジ装着部84にはヒンジ42が固定される。このため、2軸ヒンジ装置40の本体部41は、携帯電話の本体22に対して軸線xを中心に回転可能に保持される。

【0028】(第2実施形態)次に、本発明の2軸ヒンジ装置において、上述した第1実施形態とは異なる形態を有する第2実施形態について、図11～図13に基づいて説明する。なお、上述した第1実施形態と同一の構成要素については同一の符号を付し、説明を省略する場合がある。

【0029】図11は2軸ヒンジ装置の斜視図、図12は2軸ヒンジ装置の組立分解図、図147はフレキシブル基板の展開図を示している。第2実施形態の2軸ヒ

ンジ装置90は、電子機器の筐体と2軸ヒンジ装置に連通して配置されるシャフトを第2回転軸に設けた点が第1実施形態とは異なり、第1回転軸は上述した実施形態と同一のヒンジ42が採用されている。なお、ここではフレキシブル基板100の両端部100a、100bには、それぞれコネクタ126a、126bが装着されている。

【0030】かかる2軸ヒンジ装置90は、本体部91と、該本体部91に対して軸線xを中心に回転する2つのヒンジ42と、ヒンジ42の軸線x方向と直交する方向に軸線yを有し、軸線yを中心に回転するヒンジユニット94とを具備している。この本体部91を軸線x方向および軸線y方向を通してフレキシブル基板100が配置されている。フレキシブル基板100の一方の端部100aは、電子機器の一方の筐体に接続される。そして、他方の端部100bは、電子機器の一方の筐体に対して折畳み(または展開)可能であって且つ表裏逆に回転可能な他方の筐体に接続される。

【0031】本体部91には、ヒンジ42を取り付けるための取付部95が、軸線xに沿って2個所に形成されている。さらに、本体部91には、ヒンジユニット94がネジ止めされる取付部96が形成されている。具体的には、取付部96は、ヒンジユニット94をネジ止めするネジ穴99、本体部91のカバー97と合わせてヒンジユニット94を保持する半割状の保持部110とから成る。

【0032】ヒンジユニット94について説明する。ヒンジユニット94は、本体部91に固定されるブラケット111と、電子機器の第2の筐体に固定されるブラケット112と、ブラケット111とブラケット112との間において、一端がブラケット111に固定され、他端がクリック板114を介してブラケット112に回転可能に取付けられたシャフト115と、から構成されている。

【0033】クリック板114は、シャフト115の回転が所定角度になると、この所定角度で回転が停止するように設けられている。ブラケット112には、クリック板114が位置する側に向けて突出する突起117を有する付勢板116が設けられている。付勢板116は常時クリック板114方向に突出するように付勢され、突起117がクリック板114に常時接触しているように設けられている。一方、クリック板114には、突起部117を収納可能な切欠部118が形成される。

【0034】ヒンジユニット94のクリック機能について説明する。シャフト115を回転させると、突起117がクリック板114に摺接してシャフト115の回転に所定のトルクが発生する。さらに、突起117がクリック板114の切欠部118にはまりこむ(収納される)と、付勢板116の付勢力に抗して突起117を押下げないとシャフト115が回転しなくなるので、この

位置でシャフトの回転が一旦停止状態に維持される。

【0035】次に、第2実施形態のフレキシブル基板について説明する。フレキシブル基板100は、自身を巻いて形成した巻回部102と、シャフト115の周囲に巻き付けて形成された巻回部104とが形成されている。つまり、巻回部102は、軸線x上で軸線xを中心にした円の周方向に巻くように形成しており、一方の巻回部104は、軸線y上で軸線yを中心にした円の周方向に巻くように形成している。言い換えると、巻回部102、104は、フレキシブル基板100をヒンジ42およびヒンジユニット94の回転の軸線x、yを中心として軸線x、yのそれぞれの周囲にほぼ円形を描いて丸めて形成されている。かかる巻回部102は本体部91の両取付部45、45の間に配置され、ヒンジ42の軸線xを中心とした回転に対応する。そして、一方の巻回部104は、ヒンジユニット94のシャフト115の軸線yを中心とした回転に対応する。

【0036】フレキシブル基板100の両巻回部102、104を展開して広げた平面図である図13に基づいて、フレキシブル基板100の構造について説明する。本実施形態に採用するフレキシブル基板100は、2軸ヒンジ装置90のヒンジ42の回転軸の軸線xに沿って配置される平板部105と、ヒンジユニット94の回転軸の軸線yに沿って配置される平板部107とを有している。軸線x、yは互いに直交する方向であるので、平板部105と平板部107も互いに直交するように形成されている。

【0037】平板部105には、補強板120がその表面に接着剤等により貼り付けられている。補強板120は上述したようにガラスエポキシ等で構成されている。補強板120は、取り付けられた平板部105とが曲げられったり捻られったりされないように、平板状に固定するものである。

【0038】平板部105の、平板部107の接続側と反対側の端部からは軸線xに直交する方向に向けて延びる巻回片122が形成されている。この巻回片122が、平板部105を中心に巻き付けるようにして巻かれていくことにより（図13の矢印A参照）、巻回部102が形成される。一方、平板部107の、平板部105との接続側と反対側の端部からは軸線yに直交する方向に向けて延びる巻回片124が形成されている。この巻回片124が、ヒンジユニット94のシャフト115の周囲に巻回されることで（図13の矢印B参照）、巻回部104が形成される。

【0039】巻回部102を上述したように形成することで、巻回部102の中心には、軸線x方向に延び、軸線x-y平面上で該x-y平面と平行となるように配置された平板部105が位置する（図13参照）。

【0040】次に両巻回部の2軸ヒンジ内での配置について説明する。巻回部102は、巻回部の中心が軸線xを

形成する2つのヒンジ42、42の間に形成された空間部89に位置している。空間部89は、本体部91において2つの取付部45の間に形成された中空の部分である。このように巻回部102は、軸線x上で中空の位置に配置される。このとき巻回部102の中心には補強板120が取付けられた平板部105が存しているので、空間部89内に配置されていても、巻回部102は軸線x上からずれたり巻回片122の巻きがゆるんでしまったりといったようなことが防止できる。

【0041】一方、巻回部104は、ヒンジユニット94の回転軸の軸線yであるシャフト115の周囲に巻回片124が巻回されているので、巻回部104は軸線y上からずれたり巻回片124の巻きがゆるんでしまったりといったようなことが防止できる。

【0042】図14および図15には、上述してきた第1実施形態の2軸ヒンジ装置を図1～図3に示した携帯電話20に装着したところを示している。図14ではヒンジユニット94を携帯電話20の表示部24に取付けたところを示し、図15ではヒンジ42を携帯電話20の本体22のヒンジ装着部84に装着したところを示している。表示部22内ではヒンジユニット94が表示部24内に固定され、2軸ヒンジ装置90の本体部91は表示部24に対して軸線yを中心に回転可能に保持される。本体22のヒンジ装着部84にはヒンジ42が固定される。このため、2軸ヒンジ装置90の本体部91は本体22に対して軸線xを中心に回転可能に保持される。

【0043】なお、上述してきた2つの実施形態では主として携帯電話に用いる2軸ヒンジ装置についての例を説明してきた。しかし、本発明の2軸ヒンジ装置は、携帯電話に用いるものに限定されることはなく、他の電子機器に用いても良い。

【0044】また、2軸ヒンジ装置の構成としては、ヒンジの形態が上述してきたようなものに限定されることはなく、他の形態のヒンジまたはヒンジユニットを採用したものであっても好適である。さらに、上述したヒンジ42を採用した場合であっても、軸線x方向に沿ってヒンジ42を1個だけ設ける構成としてもよい。

【0045】以上本発明につき好適な実施例を挙げて種々説明したが、本発明はこの実施例に限定されるものではなく、発明の精神を逸脱しない範囲内で多くの改変を施し得るのももちろんである。

【0046】

【発明の効果】本発明に係る2軸ヒンジ装置によれば、第1の筐体と第2の筐体との間を電氣的に接続すべく配置されているフレキシブル基板を具備し、フレキシブル基板には、第1の回転軸の軸線上に巻回された第1巻回部と、第2の回転軸の軸線上に巻回された第2巻回部とが形成されていることにより、電子機器の第1の筐体が第2の筐体に対して回転した場合であっても、フレキシ

ブル基板の第 1 巻回部および第 2 巻回部が、各巻回部の径が縮小される方向または径が拡大される方向に作動するだけであるので、フレキシブル基板に折曲による負荷がかからずフレキシブル基板の破損等を防止することができる。

【0047】また、請求項 2 に係る 2 軸ヒンジ装置によれば、第 1 巻回部および第 2 巻回部の各中心に対応する位置には、第 1 平板部および第 2 平板部が設けられ、第 1 平板部および第 2 平板部の延出方向から直交する方向に曲折する第 1 巻回片および第 2 巻回片が設けられ、第 1 巻回片および第 2 巻回片が第 1 平板部および第 2 平板部の周囲を巻回することによって第 1 巻回部および第 2 巻回部とを形成している。第 1 の回動軸および第 2 の回動軸のシャフト部分ではない部位にフレキシブル基板を配置すること、つまり各回動軸の軸線上で中空に形成された部位にフレキシブル基板の巻回部を配置することができるようなる。このためフレキシブル基板に折曲による負荷をかけず破損等を防止しつつ、スペース効率よくフレキシブル基板の配置ができる。

【0048】請求項 3 に係る 2 軸ヒンジ装置によれば、第 1 平板部および／または第 2 平板部には、円周方向に巻回している軸線の軸線方向に沿って、フレキシブル基板の折曲を防止するように補強する補強板が取り付けられているので、第 1 巻回部および／または第 2 巻回部を形成する際に第 1 巻回片および第 2 巻回片を容易に平面図の周囲に巻き付けることができる。さらに、各巻回部を巻回した後に巻回部が変形したりしないように強度維持も図ることができる。

【0049】請求項 4 記載の 2 軸ヒンジ装置によれば、補強板は、第 1 平板部と第 2 平板部にわたって取り付けられるようにし字状に形成されていることを特徴とするので、各巻回部の強度維持を単一の部材で図ることができるので部品点数の削減に寄与し、さらに両巻回部の強度維持をさらに確実なものとすることができる。さらに、請求項 5 記載の 2 軸ヒンジ装置によれば、フレキシブル基板の、第 1 の筐体および第 2 の筐体に接続される一方の端部および他方の端部にはコネクタが設けられているので、当該 2 軸ヒンジを用いた電子機器の組立てにおいては組立て時間の短縮を図れる。

#### 【図面の簡単な説明】

【図 1】本発明にかかる 2 軸ヒンジ装置を用いた携帯電話において折り畳まれた所を示す説明図である。

【図 2】図 1 に示した携帯電話の表示部を開いたところを示す説明図である。

【図 3】図 1 に示した携帯電話の表示部を表裏反転させているところを示す説明図である。

【図 4】本発明にかかる 2 軸ヒンジ装置の第 1 実施形態の構成を示す斜視図である。

【図 5】本発明にかかる 2 軸ヒンジ装置の第 1 実施形態の部品構成を示す組立分解図である。

【図 6】ヒンジの構造を説明するヒンジの一部断面図である。

【図 7】フレキシブル基板の形態を説明するフレキシブル基板の平板部である。

【図 8】フレキシブル基板の巻回部の構造を説明する巻回部の側面図である。

【図 9】第 1 実施形態の 2 軸ヒンジ装置を携帯電話に取り付ける所を示した説明図である。

【図 10】第 1 実施形態の 2 軸ヒンジ装置を携帯電話に取り付ける所を示した説明図である。

【図 11】本発明にかかる 2 軸ヒンジ装置の第 1 実施形態の構成を示す斜視図である。

【図 12】本発明にかかる 2 軸ヒンジ装置の第 2 実施形態の部品構成を示す組立分解図である。

【図 13】第 2 実施形態のフレキシブル基板を説明するフレキシブル基板の平板部である。

【図 14】第 2 実施形態の 2 軸ヒンジ装置を携帯電話に取り付ける所を示した説明図である。

【図 15】第 1 2 施形態の 2 軸ヒンジ装置を携帯電話に取り付ける所を示した説明図である。

#### 【符号の説明】

20 携帯電話

22 本体

24 表示部

37, 97 カバー

39 第 2 部材

30, 40, 90 2 軸ヒンジ装置

41, 91 本体部

41a ベース

30 42, 44 ヒンジ

43 第 1 部材

45, 46 取付部

47 係合突起

49 溝部

50 フレキシブル基板

52, 54, 102, 104 巻回部

55, 57, 105, 107 平板部

59 アンクル部

60 補強板

40 62, 64, 122, 124 巻回片

70 シャフト

71 ボディ

73 中空部

74 カムプレート

76 カム

78 フィット部

80 圧縮ばね

81 取付穴

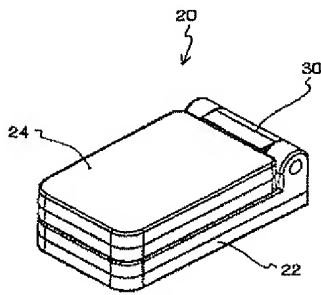
84 ヒンジ装着部

50 94 ヒンジユニット

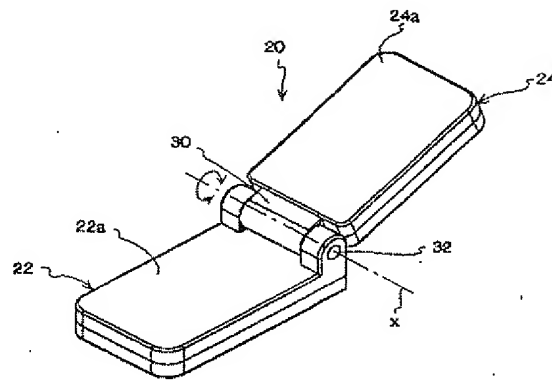
99 ネジ穴  
 100 フレキシブル基板  
 110 保持部  
 111, 112 ブラケット  
 114 クリック板

\* 115 シャフト  
 116 付勢板  
 117 突起部  
 118 切欠部  
 \* 126 コネクタ

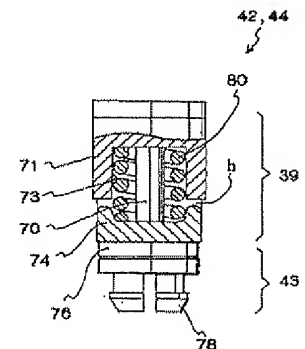
【図1】



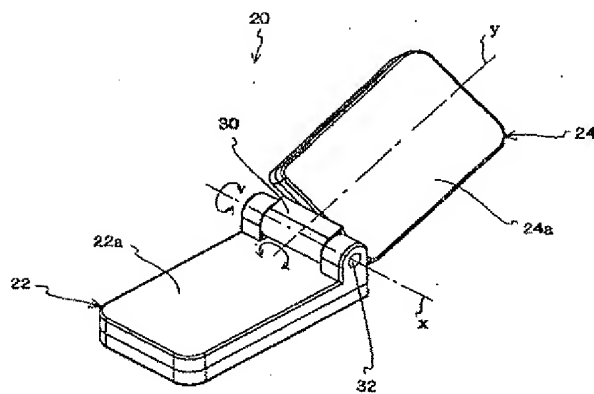
【図2】



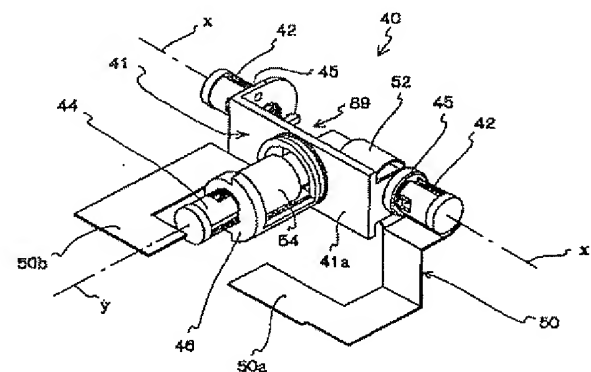
【図6】



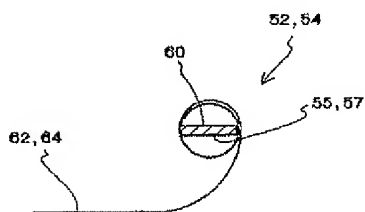
【図3】



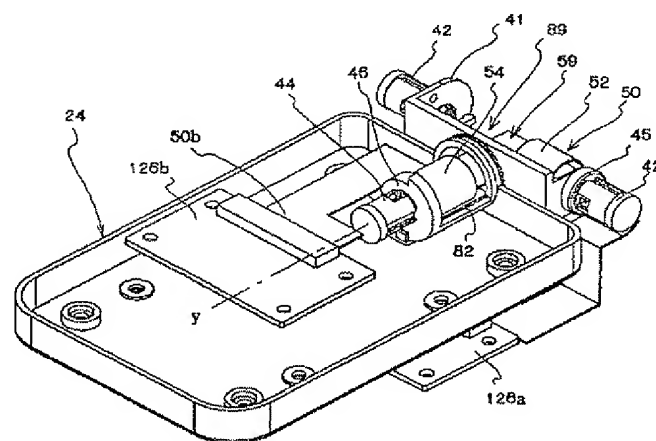
【図4】



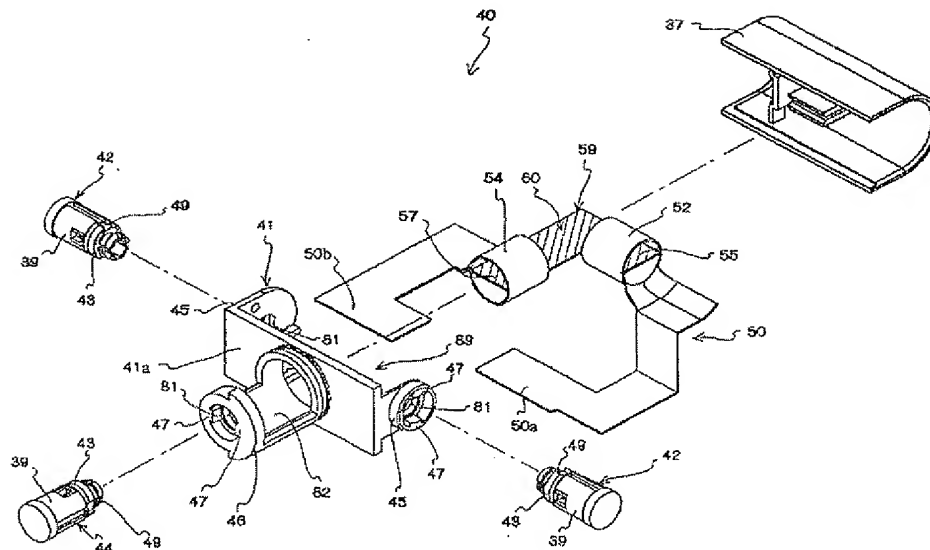
【図8】



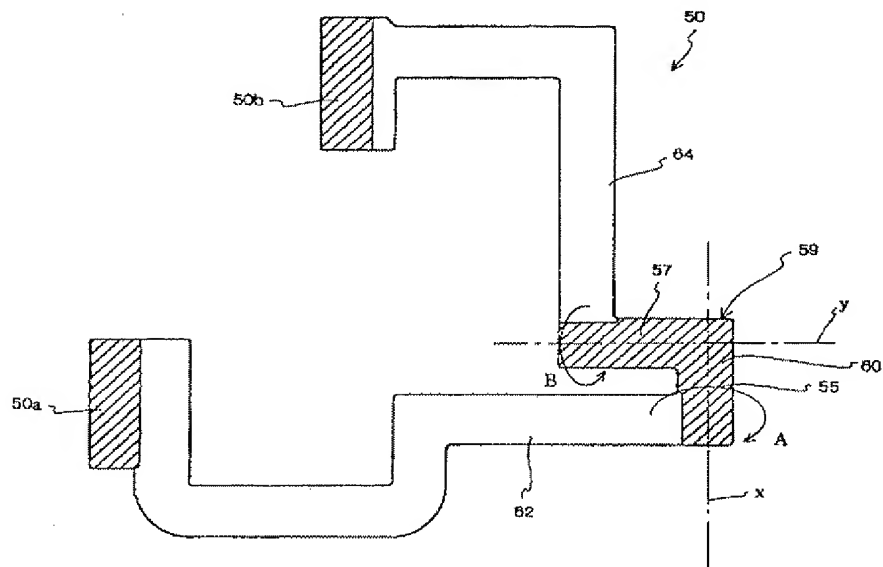
【図9】



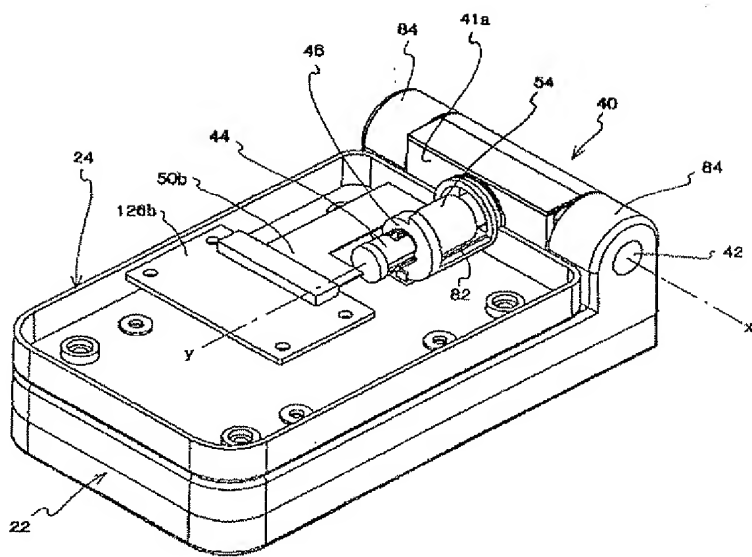
【図5】



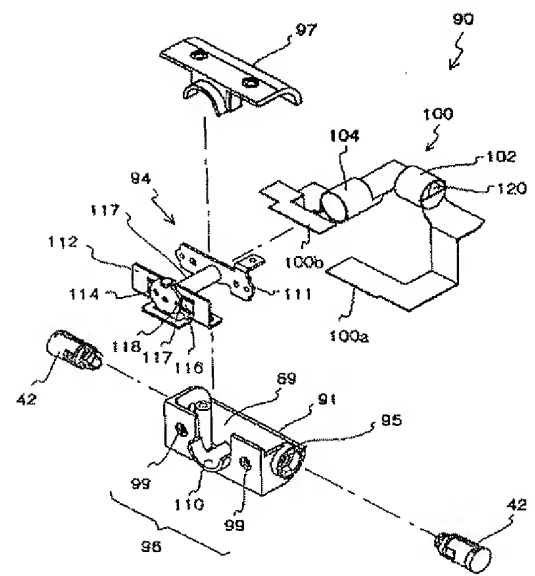
【図7】



【図10】



【図12】



【図11】

